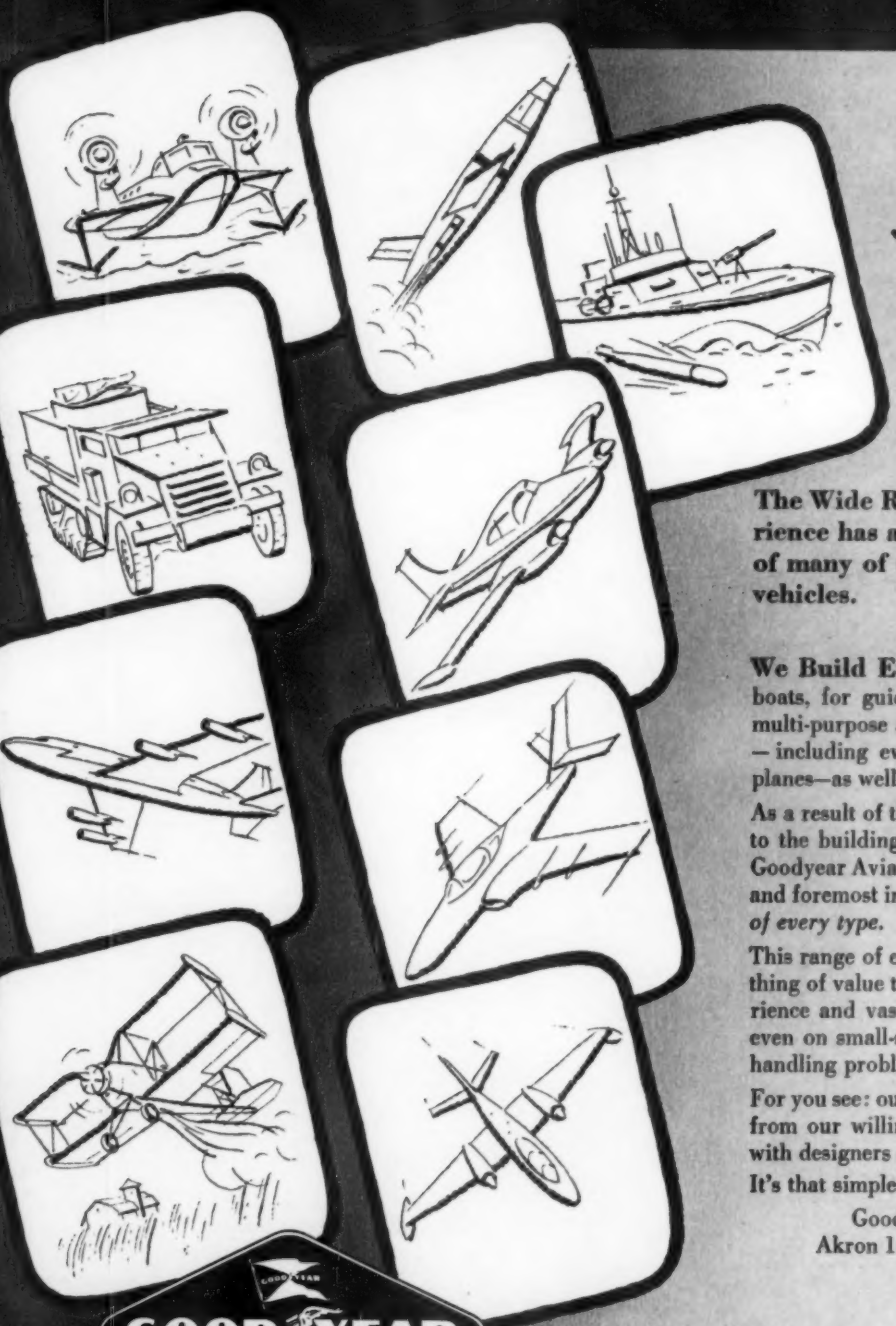
AVIATION WEEK

MAR. 28, 1955

A McGRAW-HILL PUBLICATION

50 CENTS



Speaking of range...

The Wide Range of Goodyear's Fuel Cell Experience has a direct bearing on the *longer* range of many of today's aircraft, missiles, boats and vehicles.

. . .

We Build Every Type: fuel containers for hydrofoil boats, for guided missiles, for motor torpedo boats, for multi-purpose armored vehicles, for every type of aircraft — including even insecticide tanks for crop dusting airplanes—as well as cells for fuel- and water-alcohol systems!

As a result of this experience—which goes all the way back to the building of the first successful bullet-sealing tank, Goodyear Aviation Products Division has proved itself first and foremost in coping with difficult fuel stowage problems *of every type.*

This range of experience indicates another very important thing of value to designers in every field: Goodyear's experience and vast facilities are ready and anxious to work even on small-scale projects which offer challenging fuel-handling problems.

For you see: our reputation as the best in the business stems from our willingness to tackle new approaches—to work with designers on new concepts involving new propellants.

It's that simple!

Goodyear, Aviation Products Division
Akron 16, Ohio or Los Angeles 54, California

GOODYEAR AVIATION PRODUCTS

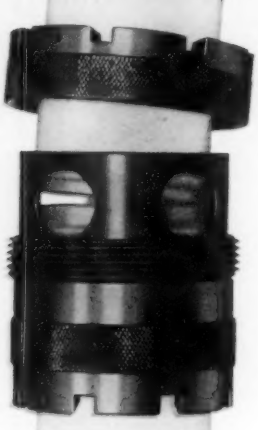
FACILITIES + ABILITIES = EXTRA plus IN PERFORMANCE

Are You Interested In WEIGHT REDUCTION?

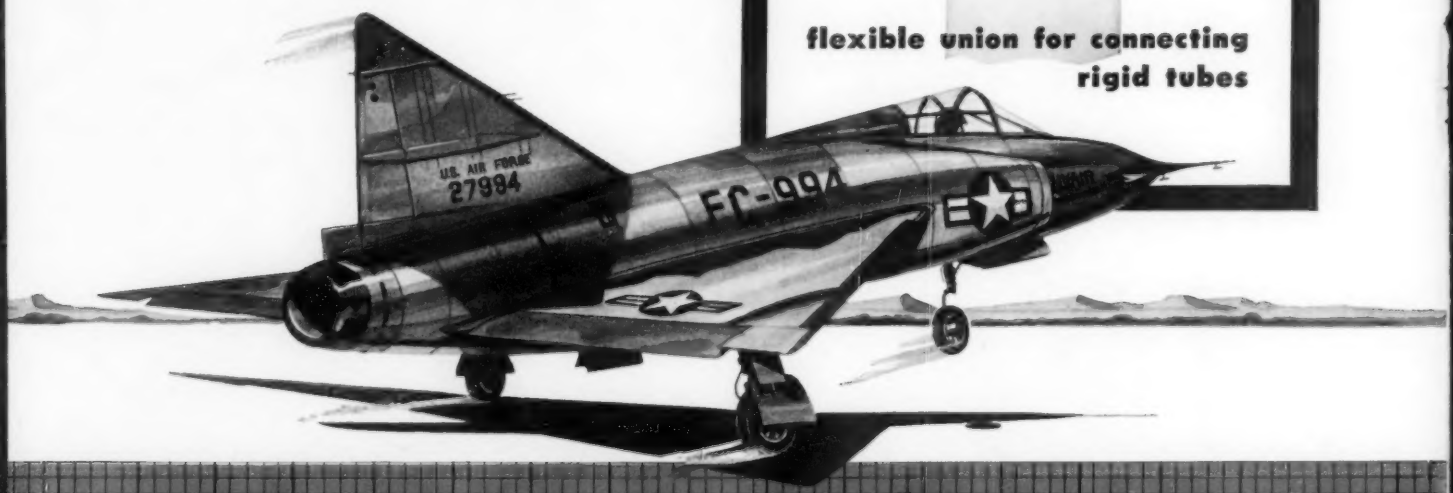
WIGGINS COUPLINGS SAVE 49 POUNDS ON CONVAIR F-102

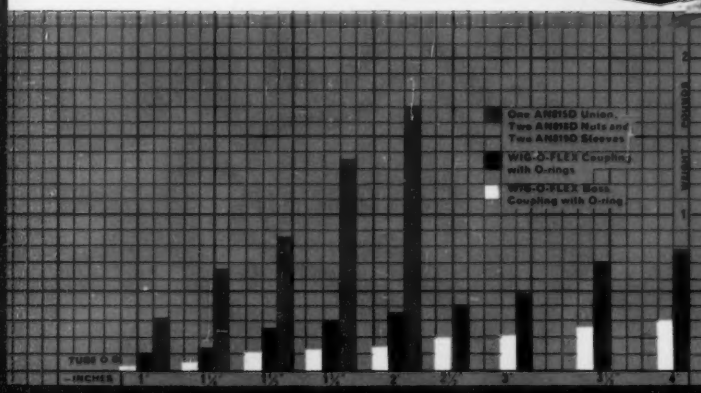
The new CONVAIR F-102 is 49 pounds lighter because WIG-O-FLEX Couplings replaced standard AN connections and cut hose. We are gratified that engineers at CONVAIR—the company that prides itself on "Engineering to the Nth power"—chose WIG-O-FLEX Couplings for a plane where weight was a major problem. The WIG-O-FLEX Coupling weighs 1/5 as much as the standard AN connection it can replace. (See weight chart for exact comparisons.)

WIG-O-FLEX COUPLING



flexible union for connecting rigid tubes




One AN815D Union, Two AN818D Nuts and Two AN819D Sleeves
WIG-O-FLEX Coupling with O-rings
WIG-O-FLEX Boss Coupling with O-ring
WEIGHT
TUBE O.D. —INCHES

WEIGHT COMPARISON CHART
WIG-O-FLEX COUPLING & AN STANDARD FLARED TUBE CONNECTION

PROVED SUPERIOR FOR FUEL, OIL, AIR

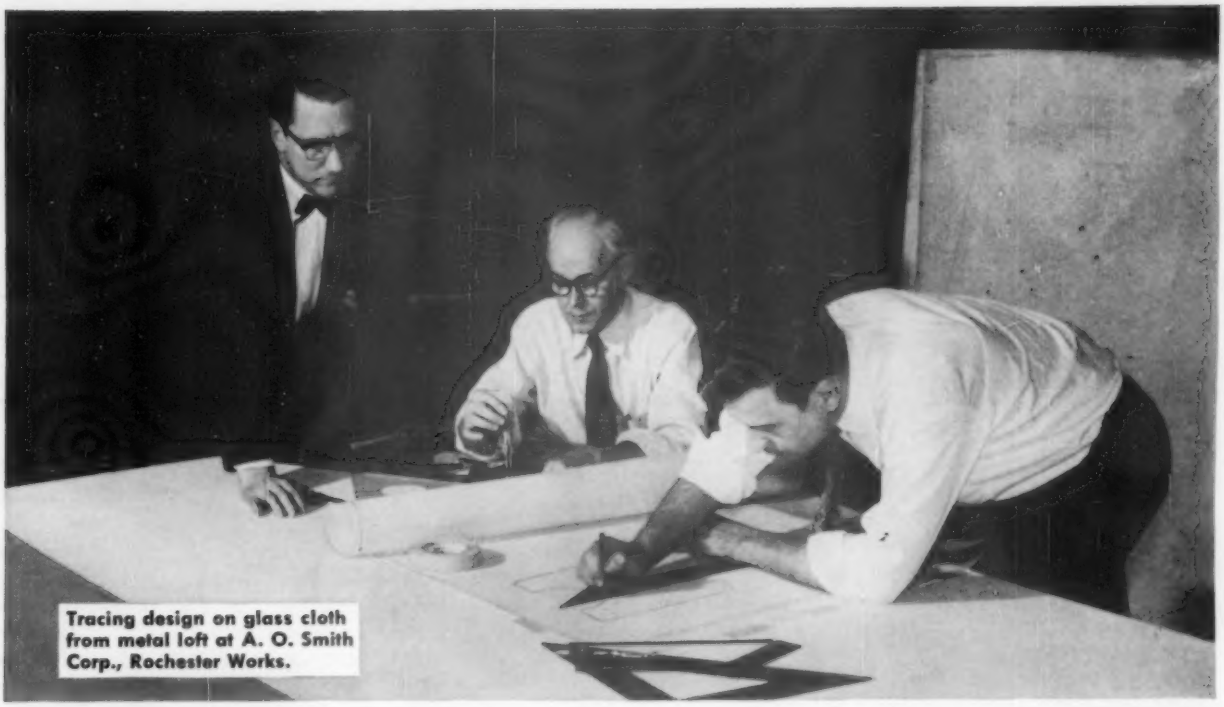
- Withstands more than 1000 psi burst pressure.
- Accommodates 4° tube flexure.
- Installs locally. 80% lighter.
- Temperature range —65°F to +250°F.

SIZES: ¼"-⅜"-½"-¾"-1"-1¼"-1½"-2"-2½"-3"-3½"-4"

WRITE FOR FURTHER INFORMATION

Wiggins

E. B. WIGGINS OIL TOOL COMPANY, INC.
3424 East Olympic Boulevard, Los Angeles 23, California



Tracing design on glass cloth from metal loft at A. O. Smith Corp., Rochester Works.

Valuable originals protected against wear and tear

At the A. O. Smith Corp.'s Rochester (N.Y.) Works, large drawings are made exactly to scale on glass cloth. Since these drawings often cost several hundred dollars each, A. O. Smith naturally does not wish to expose them to possible damage during print-making and to the wear and tear of excessive handling. Instead, they use intermediates made on Kodagraph Autopositive Paper.

Costing but a few cents a square foot, Autopositive produces positive photographic prints directly from the original drawings — without a negative step or darkroom handling. It can be exposed in standard print-making equipment and processed in standard photographic solutions. (A. O. Smith uses a vacuum-frame printer, which accommodates drawings up to 8 x 4 feet in size.)

No worries with Autopositive intermediates — they turn out sharp, legible shop prints time after time. Their dense photographic black lines do not smudge or smear. And they can be run at uniform, practical speeds in the company's direct-process machine.

In addition, A. O. Smith keeps an "Autopositive File" showing the history of changes in all their drawings. Before each revision, an Autopositive intermediate is made. Later on, direct-process prints showing the complete story of each design can be made from the intermediates as needed.

Kodagraph Autopositive Paper

"THE BIG NEW PLUS" in engineering drawing reproduction

Shows all the ways you can save with Kodagraph Autopositive Paper.

MAIL COUPON FOR FREE BOOKLET

EASTMAN KODAK COMPANY 107
Industrial Photographic Division, Rochester 4, N. Y.
Gentlemen: Please send me a copy of "Modern Drawing and Document Reproduction."

Name_____ Position_____
Company_____ Street_____
City_____ Zone____ State_____

Kodak

PROTO Torquers

Built to
AIR FORCE SPECS
Now Available

10 NEW MODEL F TORQUE WRENCHES INCLUDE 4 COVERED IN MIL-H-4034A (U.S.A.F.)

Design variations from standard Torquers to meet specific requirements of the U.S.A.F. were made in a new line of 10 PROTO torque wrenches – identified as Model F.

Four of these Torquers with plain head are covered in Specification MIL-H-4034A (U.S.A.F.), Amendment 2, dated Aug. 20, 1954 – No. 6061F (Size 1–5 to 150 in.-lbs., ¼" Dr.), No. 6065F (Size 2 – 100 to 750 in.-lbs., ⅜" Dr.), No. 6069F (Size 3 – 700 to 1600 in.-lbs., ½" Dr.), and No. 6071F (Size 4 – 1200 to 4800 in.-lbs., ¾" Dr.).

PROTO torque-*limiting* wrenches, with automatic release, are the World's fastest. They are free of external dials, pointers, and gadgets and are superior to *indicating* types in versatility, ease of use, safety and ruggedness. All models are calibrated to an accuracy of plus or minus 3% plus 2 lbs. or better, as stated in Air Force Specs.

Ask your PROTO dealer about other features of the Torquer and details of the new F models. Send 10¢ for catalog of entire line to

PLOMB TOOL COMPANY
2221U Santa Fe Ave.
Los Angeles 54, Calif.

5505

PROTO TOOLS
PROTO means PROfessional TOuch

Eastern Factory, Jamestown, N. Y. • Canadian Factory, London, Ont.

Aviation Week

MARCH 28, 1955 VOL. 62, NO. 13

Editorial Offices
New York 36—330 W. 42nd St., Phone LOngacre 4-3000 (Night LO 4-3035)
Washington 4, D. C.—National Press Bldg., Phone NAtional 8-3414
Los Angeles 17—1111 Wilshire Blvd., Phone MAdison 6-4323

Table of Contents on Page 8

55,849 copies of this issue printed

Robert W. Martin, Jr. ..... *Publisher*
Robert B. Hotz ..... *Editor*

Alpheus W. Jessup ..... *Managing Editor*

David A. Anderton ..... **Engineering**
Irving Stone ..... **Technical**
G. L. Christian .. **Equipment, Maintenance**
Katherine Johnsen ..... **Congress**
Philip Klass ..... **Avionics**
Claude O. Witze ..... **Military**
Craig Lewis ..... **Transport**
Preble Staver ..... **Transport**
Erwin J. Bulban ..... **Business Flying**
William J. Coughlin ..... **West Coast**
Bernie Lang ..... **West Coast Assistant**

Henry Lefer ..... **News Desk**
Gordon C. Conley ..... **News Desk**
G. J. McAllister .. **Washington News Desk**
Lawrence J. Herb ..... **Art Editor**
Victoria Giaculli ..... **Editorial Makeup**
Jerome E. Kelley .. **Printing & Production**

DOMESTIC NEWS BUREAUS

Atlanta 3 ..... 801 Rhodes-Haverty Bldg.
Chicago 11 ..... 520 No. Michigan Ave.
Cleveland 15 ..... 1510 Hanna Bldg.
Detroit 26 ..... 856 Penobscot Bldg.
Houston 25 ..... 1303 Prudential Bldg.
Los Angeles 17 ..... 1111 Wilshire Blvd.
San Francisco 4 ..... 68 Post St.
Washington 4 .. 1189 National Press Bldg.

FOREIGN NEWS SERVICE

Editor ..... John Wilhelm
Associate Editor ..... Georgia Macris
London ..... Edward W. S. Hull
Paris ..... John O. Coppock
Bonn ..... Gerald W. Schroder
Mexico City ..... John H. Kearney
Sao Paulo ..... Lionel J. Holmes
Tokyo ..... Dan Kurzman

Aviation Week is served by PRESS ASSOCIATION, INC., a subsidiary of Associated Press.

Research and Marketing: Irina Nelidow, Mary Whitney Fenton, Jeanne Rabstejnek, and Mildred Raba.

J. G. Johnson ..... *Business Manager*

T. B. Olsen, **Promotion Manager** W. V. Cockren, **Production Manager**

Sales Representatives: J. C. Anthony, **New York**; H. P. Johnson, **Cleveland**; D. T. Brennan and J. S. Costello, **Chicago** and **St. Louis**; E. P. Blanchard, Jr., **Boston**; James Cash, **Dallas**; William D. Lanier, Jr., **Atlanta**; T. Evans Wyckoff, **San Francisco**; C. F. McReynolds and Gordon Jones, **Los Angeles**; W. S. Hessey, **Philadelphia**; C. A. Ransdell, **Detroit**. Other sales offices in **Pittsburgh, London.**

AVIATION WEEK • MARCH 28, 1955 • Vol. 62, No. 13
Member ABP and ABC

Published weekly by the McGraw-Hill Publishing Company, James H. McGraw (1860-1948), Founder. Executive, Editorial, Advertising and Subscription Offices: **McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y.** Publication Office: 99-129 North Broadway, Albany 1, N. Y. Donald C. McGraw, President; Willard Chevalier, Executive Vice-President; Joseph A. Gerardi, Vice-President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Executive Vice-President Publications Division; Ralph B. Smith, Vice-President and Editorial Director; Nelson Bond, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Vice-President and Director of Circulation.

Subscriptions: Address correspondence to AVIATION WEEK—Subscription Service, 99-129 North Broadway, Albany 1, N. Y. or 330 West 42nd St., New York 36, N. Y. Allow 10 days for change of address.

Subscriptions are solicited only from persons who have a commercial or professional interest in aviation. Position and company connection must be indicated on subscription orders.

Single copies 50¢. Subscription rates—United States and possessions, $6 a year; $9 for two years; $12 for three years. Canada $8 a year; $12 for two years; $16 for three years, payable in Canadian currency at par. Other Western Hemisphere and the Philippines $10 a year; $16 for two years; $20 for three years. All other countries $20 a year; $30 for two years; $40 for three years. Entered as second-class matter July 16, 1947, at the Post Office at Albany, N. Y., under Act of Mar. 3, 1879. Printed in U. S. A.

Copyright 1955 by McGraw-Hill Publishing Co., Inc.—All Rights Reserved. Cable Address: "McGraw-Hill New York." Publications combined with AVIATION WEEK are AVIATION, AVIATION NEWS, AIR TRANSPORT, AERONAUTICAL ENGINEERING and AIRCRAFT JOURNAL. All rights to these names are reserved by McGraw-Hill Publishing Co.

NORTH AMERICAN HAS BUILT MORE AIRPLANES THAN ANY OTHER COMPANY IN THE WORLD

Engineers: North American offers unusual opportunities. Write: Engineering Personnel Office, Los Angeles or Downey, California; or Columbus, Ohio.

READY! AMERICA'S FIRST SUPERSONIC SQUADRONS

North American F-100 Super Sabres—now on active operational duty with the 479th Fighter Wing at George Air Force Base, Victorville, California—form America's first Supersonic Squadrons . . . a powerful new defense force unequalled anywhere in the world.

Exemplifying a totally new concept for modern air power, the North American designed and built F-100 Super Sabre flies beyond the speed of sound in level or climbing flight, and is designed to perform equally well in air combat or close-support bombing missions.

This year, to better meet our Air Force needs, North American will produce F-100 Super Sabres at its Columbus, Ohio plant in addition to continued production at Los Angeles.

Constant research and development keep North American foremost in aircraft, rocket engines, guided missiles, electronics and peaceful applications of atomic energy.

ENGINEERING AHEAD FOR A BETTER TOMORROW

NORTH AMERICAN AVIATION, INC.

Remington Rand

BETTER BUSINESS METHODS

For Greater Profits Through Lower Costs

PRODUCTION... ON SCHEDULE! with the SCHED-U-GRAPH Machine Loading System

The Sched-U-Graph machine loading method helps you plan for maximum production per dollar from machines, men and facilities. Using the Gantt Principle of charting loads and progress against time, Sched-U-Graph displays all factors in a visible margin for immediate management action! This system provides a method for rough loading by machine center and fine loading by individual machine. As work rolls through each operation the Sched-U-Graph picture keeps changing; always pinpointing the current time-load-machine situation.

During the installation of Sched-U-Graph at the Hughes Aircraft Company, Los Angeles, it was revealed that through proper scheduling considerable money could be saved in labor and parts. And Sched-U-Graph has gone on to provide *daily* operating savings for them. It can for you! Circle KD738 for our six page color folder which shows a complete Sched-U-Graph machine loading operation.

New 10-Drawer Map and Plan Unit Gives You More Usable Drawer Space

Our studies show that in most instances only the bottom 1" of the old style 5 drawer map and plan unit depth could be used conveniently. The new unit has 10 drawers—one inch deep—in the same cabinet height as the old 5 drawer unit! The result... you now can use all the storage space you pay for! What's more, the unit matches Remington Rand Aristocrat files in height and depth, providing more counter work area.

Each drawer may be partitioned into 2, 4, or 8 sections for smaller drawings. Units can be stacked and bolted together.

Units can be inserted into Remington Rand Safe-Cabinets for *certified*, insulated, point-of-use protection. For the complete story from our free illustrated folder, Circle LBV703.

BSD* Maintenance Planning Program Cuts Costs — Increases Efficiency for Hooker Electrochemical Company

Unusual expansion and increased demands on the physical plant of the Hooker Electrochemical Co., Niagara Falls, N. Y., required a complete alteration of its maintenance procedures. Expansion of older programs was judged impractical and Remington Rand *Business Services Department engineers were asked to analyze existing methods and offer solutions to increase plant maintenance efficiency and decrease operating costs.

Their recommendations (now part of the company's standard procedures): the transfer of Planning and Scheduling responsibilities; new Works and Order Estimate Forms to control planning and costs; a new Commodity Classification System to standardize nomenclature and stock numbering; new Maintenance Project Planning Charts to control day-to-day job progress.

New methods are employed to: appraise machine performance, develop inspection routines, prevent capital tie-up in obsolete parts, control the size of the work force, and provide accurate up-to-date cost data. All levels of management have a complete—accurate maintenance picture for quick fact-founded decisions.

We Can Do the Same for You

No one system can solve *all* maintenance planning problems for *all* companies, but, experienced Business Services Department systems consultants can create a tailor-made program for you. Read the Hooker Electrochemical story. Circle CH952.

Remington Rand

Room 1354, 315 Fourth Ave., New York 10

Please send me FREE literature circled below:

LBV703 CH952 KD738

Name_____

Company_____

Address_____

City_____ Zone____ State_____

1-24A

NEWS DIGEST

Domestic

Three transports crashed in separate accidents last week. Near Honolulu, a Navy R6D rammed into a cliff while letting down through an overcast to Hickam Field. All 66 persons aboard were killed. At Springfield, Mo., an American Airlines Convair 240 crashed two miles north of the airport, killing 12 persons and injuring 23. In Chicago, an American DC-7 crash-landed at Midway Airport with no serious injuries.

New airborne Tacan receiver developed by Collins Radio Co. reportedly showed greater accuracy during first flight test than the original models built by another firm and now in production. Primary objective of the Navy-sponsored Collins project, launched several years ago, is to improve reliability of the Tacan receiver.

Civil Aeronautics Board's new general counsel is Franklin M. Stone, former city attorney for Waseca, Minn., and onetime special agent for the Federal Bureau of Investigation. He succeeds Emory T. Nunneley, who resigned effective Apr. 1.

Test center of the American Helicopter Division of Fairchild Engine & Airplane Corp. at Mesa, Ariz., is on a caretaker status following its recent shutdown. At its peak, the unit had about 25 employes for whirl-test projects.

New $15-million order was awarded Servel, Inc., by Republic Aviation Corp. for extended production of F-84F wings and other components. The Evansville, Ind., subcontractor will make deliveries under the new contract from July 1955 through September 1956.

David C. Moore, formerly of International Business Machines Corp., is new special assistant to Roger Lewis, USAF Assistant Secretary for Materiel.

Bell Aircraft Corp. granted pay increases ranging from 2.5% to 2.7% to all salaried employes at the Texas Division in Ft. Worth under a new agreement ratified by United Auto Workers (CIO) and the Bell Production Engineering Assn.

Mohawk Airlines will celebrate its 10th anniversary Apr. 2.

First over-water air race of the Ninety-Nines, international organization of women pilots, will be held June 9-14 from Washington, D. C., to Havana, Cuba. Competing in the handicap will be 100 women in 50 lightplanes.

Hannibal C. Ford, founder of Ford Instrument Co. and inventor of aircraft fire-control devices, died Mar. 12 at Kings Point, N. Y.

BOAC Raises Britannia Order to 33

Ten Mk. 300LR long-range turboprop-powered Bristol Britannias, capable of flying more than 90 passengers nonstop over the North Atlantic, have been ordered by British Overseas Airways Corp. Earlier contracts include eight Mk. 300s and 15 Mk. 100s. A production version of the latter is seen taking off from Filton, England at 150,000 lb. maximum gross weight on its way to Johannesburg, South Africa. BOAC is ordering 60 Bristol B.E. 25 "supercharged" turboprops to replace the Proteus engine in some Britannias. B.E. 25 deliveries are expected in 1958/59.

Financial

Braniff Airways report a net income for 1954 of $3,712,313, increasing from $10,964 in 1953. The earnings included profits from property and equipment sales totaling $1,797,111 in 1954 and amounting to $1,885,549 the preceding year.

Ryan Aeronautical Co., San Diego, predicts its business volume for fiscal 1955 will equal the preceding year's $45 million in gross sales.

North Central Airlines reports a net income of $1,977 for last month, the first profitable February in the company's history. The local service airline now has a record of returning a profit for 10 consecutive months.

Emery Air Freight Corp. had a net income of $141,928 in 1954, compared with $122,321 for the previous year. Total revenue increased to $5,383,525 from $5,379,107.

Swissair's gross earning for 1954 totaled $25,850,000, a 35.5% increase over 1953.

International

A. V. Roe Canada's development program was set back an estimated six months last week by a $5-million fire that swept through the company's hangar at Malton (Ont.) Airport, destroying four advanced aircraft plus some experimental engines and equipment.

India's Air Headquarters is trying to set up a local source of aircraft engines. Senior officers have held preliminary discussions on the plan with representatives of Bristol Aeroplane Co. and Rolls-Royce, Ltd.

Canadian Pacific Airlines plans to inaugurate direct Tokyo-Amsterdam flights June 1 over a transpolar route.

Proposed merger of Japan Helicopter & Airplane Transport Co. and Kyokuto Aviation Co. is expected to be concluded in July. Japan Helicopter, capitalized at $417,000, and Kyokuto, at $556,000, both suffered large deficits last year.

KLM Royal Dutch Airlines is buying into Columbia's Sociedad Aeronautica de Medellin, plans to increase the cargo airline's $400,000 capital substantially and allow the latter to start passenger business.

Scandinavian Airlines System will increase transpolar Los Angeles-Copenhagen service to three flights weekly in both directions Apr. 19 to handle increased load factors. SAS has been flying the route twice weekly since Nov. 15.

A new standard of insulation performance

Resinite®

VINYL GLASS

ELECTRICAL INSULATION SLEEVING

A superior vinyl impregnated Fiberglas* insulation, Resinite Vinyl Glass sleeving offers dependable performance under extreme conditions.

- For operation from —50° to 395° F (20 hours)
- Maintains flexibility and dielectric strength after 1000 hrs at 300° F
- Withstands creasing, pounding, twisting and bending without loss of dielectric strength
- Excellent chemical and oil resistance
- Won't craze or crack
- Grades B-A-1, B-B-1 and B-C-1
- Sizes #24 to ⅜"
- Eleven colors
- Priced comparable to ordinary cotton or rayon base insulations

*Reg. TM — Owens-Corning Fiberglas Corp.

Ask your Resinite representative or write for samples and performance data.

Resinite

RESIN INDUSTRIES, INC.

315 Olive St. • Box 1589 • Santa Barbara, Calif.

VINYL SLEEVING AND TUBING FOR THE AIRCRAFT, ELECTRONICS AND PHARMACEUTICAL FIELDS

The Aviation Week

March 28, 1955

Headline News

Long-Range Interceptor Choice Near.. 13
Airframe Industry Losing Business..... 14
Forum Reports on Human Factors..... 14
Allison Expands Facilities..... 15
Renegotiation Act Extension Likely.... 15
Southwest Wins 'Test' Contract..... 16
Airlift Contract Awards..... 16
3 Firms Report Profits..... 17
Research Lag Cited by NACA..... 18
Fokker Asks U. S. Certificate..... 18
Blimps Join New Team..... 21
Aircraft Profits Continue to Climb..... 25

Aeronautical Engineering

Rocket Group Urges Satellite Study.... 28
Handy Kit Aids F-101 Test Staff..... 30

Production

Tape Will Run Convair Miller..... 36
Titanium Bolts Available in Quantity.. 38

Avionics

Airborne Computer Uses Transistors.. 49

Equipment

Trainer For F9F-9 Cockpit Routine.... 58
Jet Engine Igniter Guarantees Starts... 61

Air Transport

ACC Reassures Congressmen..... 84
National Plans Second Copter Route... 85
Comet 4 Rebids for Orders..... 85
UAL Executive Flights..... 86
Slick Okays R6D Test..... 86
Convair Demonstrates Quiet 340..... 87
EAL Asks Fare Hike..... 87
Court Upholds Cal Central Sale..... 87
NEA Buys 10 DC-6s..... 87

Editorials

Tacan vs. DME—A Bad Mess..... 90

Departments

News Digest 7
Picture Page 9
Industry Observer 11
Washington Roundup 12
Who's Where 11, 27
Thrust & Drag..... 34
Production Briefing 40
USAF Contracts 44
Navy Contracts 45
Filter Center 56
What's New 62
New Aviation Products..... 69
Also on the Market..... 71
Aviation Calendar 72
CAB Orders 88
Shortlines 88

Picture Credits

7—Bristol Airplane Co.; 9—(top) Grumman, (center) Fairchild; 15—deHavilland, Canada; 44—Wide World; 49—Bell Telephone Lab; 58—Grumman; 84—Lockheed; 86—CAB.

SIMPLEX WITH THE *narco* SIMPLEXER

12 CHANNEL VHF RECEIVER TRANSMITTER

Perfect as a basic communication set, perfect as a second, separate auxiliary radio, the NARCO Simplexer is a versatile unit with wide-band 12 channel VHF transmitter (108-127 megacycles) and VHF receiver.

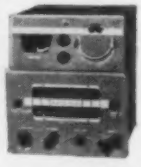
Its exclusive "whistle-stop" tuning feature lets you find desired frequencies with the same positive precision as with far more expensive crystal-controlled receivers.

Thousands of dependable, ruggedly-built Simplexers are in daily use in multi- and single-engine business planes. For reliable, dependable long-distance communication, specify Simplexer. Compact, easy to install.

OMNIPLEXER

Adds OMNI Navigation function to SIMPLEXER utility

This 2½ pound "pancake-designed" Omniplexer can be plugged into any existing Simplexer to give accurate Omninavigation. Dual function left-right/to-from indicator contributes to compactness; vernier control assures accurate course selection.



The Omniplexer/Simplexer combination provides a perfect navigation and communication package and permits addition of dual Omni at surprisingly low cost.

Omniplexer attachment ..... only $195

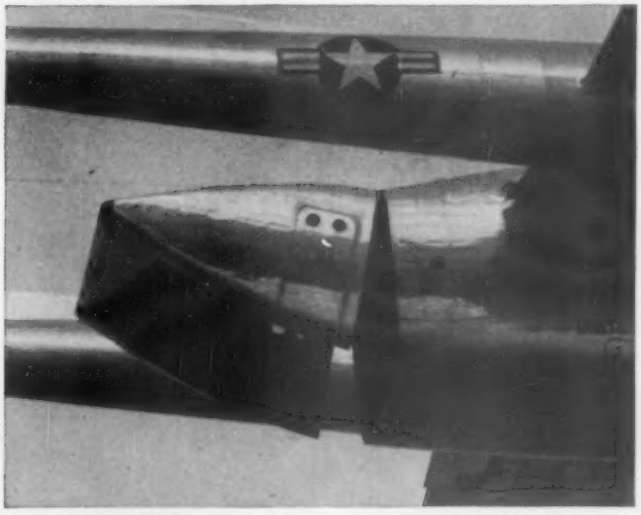
SEE YOUR NEAREST NARCO DEALER

narco

NATIONAL AERONAUTICAL CORPORATION

Ambler, Pennsylvania

GRUMMAN F9F-8 COUGARS of VF-121, Pacific Fleet Air Force, provide the first large formation of the new sweptwing Navy fighters. The Squadron, based on the West Coast, has 100% availability on this flight; two of its 22 Cougars are outside camera range.



F9F-8s in Service, C-119 Modification, Jet Copter Flies High

FAIRCHILD WILL RETROFIT more than 100 C-119s with this operable-in-flight, rear cargo door, which has undergone tests at Hagerstown, Md. (left). Hydraulically operated system permits retracting bottom of rear fuselage into upper portion for dropping paratroops or bundles; entire rear fuselage can be raised to airdrop heavy equipment and supplies.

S.O. 1221 DJINN jet-powered copter has landed 11,300-ft. high in the Bernese Alps carrying a passenger. On the same flight the Djinn landed on a neighboring peak 13,400-ft. high. Turbine-powered Sikorsky XH-39 attained 24,500 ft. Oct. 17, 1954.

can you see the difference?

MARMAN
STAINLESS STEEL STRAPS

Rugged support problems become easy

choose **your style**... plain end, loop end or slotted loop end, T-bolt or quick coupler latch... there is a stainless steel Marman strap size and type to handle your specific requirement. Marman engineering and production personnel, with modern equipment and years of experience, are ready to design and manufacture to your requirements. There is a Marman engineer as near as your phone. Write, wire or phone today and let him join your design team.

MARMAN

MARMAN PRODUCTS COMPANY, Inc. 11214 EXPOSITION BLVD., LOS ANGELES, CALIF.

Marman products are manufactured under various U. S. and foreign patents and other patents pending

WHO'S WHERE

In the Front Office

Earl D. Johnson, who resigned as president of Air Transport Assn. to join General Dynamics Corp. last month as vice president-development and operations, has been elected to the New York company's board of directors.

H. Max Healey has been appointed U.S. vice president for Avianca, Colombian affiliate of Pan American World Airways. **Herbert Wild** is new vice president-traffic and sales.

Honors and Elections

Marion P. Crews has been elected president of the National Association of Manufacturers Representatives. Other new officers: **Charles P. Haskell**, 1st vice president; **O. P. Krich**, 2nd vice president; **Mildred Harmon**, secretary; **A. T. Larned, Jr.**, treasurer, and **Howard Ingle**, sergeant-at-arms.

W. Sidney Park, president of Park Aerial Surveys, has been recently named president of the American Society of Photogrammetry.

Robert R. Pero, quality control chief for Servomechanisms, has been elected chairman of the New York section of American Society of Quality Control.

Changes

Cmdr. George W. Fey, former public relations officer for Navy's Bureau of Aeronautics, has joined the administrative staff of Sikorsky Aircraft Division of United Aircraft Corp., Bridgeport, Conn.

Harvey L. Hansberry, onetime chief of the powerplant branch of Civil Aeronautics Administration's Technical Development and Evaluation Center at Indianapolis, is new chief engineer of the Fireye Division of Electronics Corporation of America, Boston.

John C. Buckwalter has moved up in Douglas Aircraft Co. from chief engineer of the Long Beach (Calif.) Division to assistant to the vice president-engineering at Santa Monica. Also promoted: **Carlos C. Wood**, chief engineer at Long Beach; **C. S. Glasgow**, new tooling manager at Santa Monica.

Edwin E. Parker has been appointed general manager of General Electric Co.'s Instrument department, Lynn, Mass.

R. Glenn Gorman has been promoted to manager of Houdaille-Hershey Corp.'s Aircraft Division, Buffalo, N. Y. Other changes: **W. S. Call**, Aircraft Division sales manager; **Robert E. Marsh**, factory manager.

Robert A. Lehman has become manager of Servomechanisms' Western Division, El Segundo, Calif.

Parke W. Moewe, former corporation counsel for Flying Tiger Line, has been named general counsel of Pacific Airmotive Corp., Burbank, Calif.

John W. Cole has resigned as chief of flight test for Piasecki Helicopter Corp. to take a position at Wright-Patterson AFB, Dayton.

INDUSTRY OBSERVER

► New air defense missile seen as a Nike replacement will be developed jointly by Radio Corporation of America and American Machine and Foundry. RCA is prime contractor, with AMF facilities scheduled for mechanical development and eventual production. Initial contract amount is $20 million, split about evenly during early stages of the project.

► **New cockpit instrumentation layout developed by Hughes Aircraft Co. has only five presentations for pilot to watch. Vertical indicators show speed and altitude data. Two scopes present aircraft attitude, flight path, terrain clearance, weather and collision data. Fifth presentation is complete navigational aid with automatic plotting of aircraft position. Layout was developed as sideline to gunfire control system project.**

► Handley Page Victor bomber has flown more than 6 hr. at 50,000 ft., according to statements made in British parliamentary debate. The second prototype Victor has a new tail, re-designed according to recommendations made by the Royal Aeronautical Establishment at Farnborough.

► **Convair is trying to sell Navy a production quantity of its XFY-1 vertical takeoff and landing interceptor as trainers for VTOL and transition flight. Aircraft will not be used operationally because of faster jet-powered Vtols being developed by Bell Aircraft and Ryan Aeronautical. XFY-1 prototype is being dismantled at Convair's San Diego plant for overhaul, soon will return to Brown Field for more flight testing. Flight operations are scheduled to resume in April. A rate-of-descent meter is being installed at the request of Convair test pilot Skeets Coleman.**

► A. V. Roe of Canada's CF-105 fighter will have a Mach 2 speed, according to Crawford Gordon, Jr., president of the firm. Avro also reports that more than 2,000 Orenda jet engines have been produced at the Toronto plant.

► **Convair F-102A has flown supersonically at speeds "approximately 100 mph. in excess of the original design performance" and also exceeded altitude performance expected from the original YF-102 design. The F-102A incorporated a number of design changes for drag reduction and reduced gross weight through the substitution of titanium parts for steel.**

► Goodyear Aircraft Corp. has two jet thrust reversers under development. One is an aerodynamic type, the other mechanical.

► **Republic Aviation's supersonic, delta-wing advanced interceptor, the F-103, incorporates a periscope to help the pilot see out of the flush-designed cockpit.**

► New Navy emergency escape system developed for VTOL aircraft features automatic separation of pilot from seat before the seat leaves the cockpit. Static lines restrain seat for positive separation and also open parachute. Tests indicate safe escapes down to 25 ft. altitudes with a forward airspeed of about 200 knots; at zero airspeed during landing, escapes should be possible down to 200 ft. altitude.

► **Boeing B-52 bomber recently made a belly landing at Edwards AFB, Calif., when its rear landing gear collapsed as it touched down on the runway. Landing gear of the aircraft was damaged extensively.**

► Australia's testing ranges at Woomera and the operations of the long range weapons research establishment at Salisbury, near Adelaide, have been recently combined under the new title of Weapons Research Establishment.

► **Societe Paul Aubert is building a four-place version of its Cigale private plane to be powered by a 150-hp. Lycoming engine. Top speed of the cantilever high-wing aircraft is expected to be about 150 mph. First plane is scheduled to be delivered this year.**

Washington Roundup

Aircraft Earnings

Investigations of the financial position of leading Air Force contractors are planned by at least two committees of Congress: Senate Banking and Currency and House Appropriations Committee.

The objective is to determine what effect defense business has had on earnings and financial status.

Rep. Jaime Whitten, a member of House Appropriations Subcommittee on Air Force, observed: "When contracts are let on a bid basis, competition takes care of earnings. But when contracts are negotiated, the only way to judge the procurement policies of the Defense Department is to consider the effect of these on the financial position of the contractors."

While the primary concern of the appropriations group is an evaluation of Defense Department business practices, the main concern of the banking and currency group is to determine what effect defense business has had on the stock market, in particular, and the economy generally.

Senate Banking and Currency Committee and at least one other congressional group—House Small Business Committee—have requested Defense Department for up-to-date reports on the 100 concerns receiving the largest dollar-volume of defense business and plan to make them public.

House Small Business Committee's primary interest is in the concentration of government business with big firms.

Airline Profit "Offsetting"?

While House Appropriations Committee was criticizing Civil Aeronautics Board for moving too slowly in applying the Supreme Court decision requiring airlines to use earnings of one division to reduce subsidy of another, three members of Senate Commerce Subcommittee on Aviation introduced legislation to void the court decision. The sponsors: Republican Sens. Andrew Schoeppel and Frederick Payne and Democratic Sen. Alan Bible. Their bill would give the Board explicite authority to set mail pay and subsidy on a division-by-division basis. It is confronted with strong opposition, making enactment unlikely.

Pentagon 'Scoops'

Continued complaints against military abuse of classified information to provide "scoops" for uniformed writers and certain magazines now is promised top Defense Department action. Defense Secretary Charles E. Wilson, prodded at a press conference about a forthcoming story by a Navy officer on a subject rendered taboo to Pentagon reporters, said he would study the situation. Efforts of military men to sell what they know, even when they get special release from the Defense Department, is a source of much criticism from professional reporters. In addition there is a strong tendency, especially in the Navy, to favor certain magazines by timing release of classified information to accomodate their publication dates.

CAB Vice Chairman

The Administration is reverting to the policy of previous Democratic administrations of having a minority member serve as either chairman or vice chairman of Civil Aeronautics Board with the appointment of Democratic Member Joseph Adams as vice chairman.

The policy was dropped recently when President Eisenhower named Republican Chan Gurney as chairman and Republican Harmar Denny as vice chairman.

Permanent Feeders

Legislation directing Civil Aeronautics Board to give permanent certificates to the 14 existing local service airlines has taken long strides toward enactment by winning approval from House Commerce Committee and Senate Commerce's Subcommittee on Aviation.

Only difference between the two: The Senate version would give CAB authority to exempt from permanent certification up to one half of the points on a carrier's system that are unprofitable; the House version would not give the Board this authority.

Under both measures, CAB would be required to issue permanent certificates unless, since the date of last certification, service was "inadequate and inefficient."

Turbine Tension

Hottest aviation issue in the Pentagon: turbine engines, their role in delaying aircraft procurement, where the blame should be laid and what should be done about it. There are signs of growing tension, with feeling running high between Defense Department and the armed services. Biggest firecracker was speech by Assistant Secretary of the Navy for Air James H. Smith, Jr., copies of which are in demand (AW Mar. 21, p. 18).

Defense Committee sessions to discuss the problem will be secret, volatile. Report is expected in a month.

Pacific Mail Battle

Transfer of military mail from the Military Air Transport Service to scheduled commercial carriers, expected to take both Pan American World Airways and Northwest Airlines off subsidy in the Pacific, is causing a stiff struggle between the two trans-Pacific operators.

Original plan of sharing the traffic at an equal rate of 50 cents a ton-mile means a division of some $15 million to $20 million and a subsidy-free service. Now a battle has developed because Northwest is getting the bulk of the traffic on a time and mileage differential. Northwest has the advantage over Pan Am with its Great Circle route to Tokyo, some 1,200 mi. shorter and eight hr. faster. Both Defense Department and the Post Office insist the shorter, more economical route be used.

Post Office has suggested an alternative of equalizing the mileage for the two carriers as a solution to the subsidy problem. Neither airline has expressed interest, and Northwest specifically objected on grounds that it would be discriminatory.

Pan Am has taken the position that the situation can be resolved only if it, too, can fly the shorter Great Circle route. In the recently completed Trans-Pacific Renewal Case, Civil Aeronautics Board rejected PAA's application in favor of continuing Northwest alone, but the President reversed the Board by deferring action for three years.

Industry observers predict the seriousness of the two carrier's rivalry may require presidential intervention before the end of the three-year trial period.

—Washington staff

AVIATION WEEK VOL. 62, NO. 13
MARCH 28, 1955

Long-Range Interceptor Selection Near

- **USAF expected to pick new supersonic aircraft; goal calls for competition winner to be operational by 1960.**

Air Force will make a decision in a matter of weeks on the 18-month-old supersonic long-range interceptor competition.

In the face of widespread industry conviction that too much time has been spent making a determination in view of the original goal to have the plane in operational use by the early 1960s, a recommendation by the Aircraft and Weapons Board will be presented soon to the Air Council.

▶ **Status of Proposals**—Authoritative sources say the Air Force will order a new aircraft, denying current rumors that proposals submitted several months ago will be dropped in favor of a larger version of McDonnell Aircraft Corp.'s F-101 Voodoo, an entry in competition.

The long-range interceptor proposals currently are at USAF headquarters, having passed through the command level of Air Materiel and Air Research and Development Commands. Air Force spokesmen say there has been no change of specifications since the request for proposals was sent out in the fall of 1953. Certain clarifications have been circulated, always as the result of inquiries from manufacturers.

In addition to McDonnell's new F-101, major contenders include Lockheed Aircraft Corp., with an advanced very highspeed interceptor design; Convair's entry of a fighter version of its B-58 supersonic bomber, without its bomb-loaded pod, and Northrop Aircraft, which has submitted a new design for a large twin-jet aircraft. Douglas Aircraft Co. also has submitted a proposal in the competition.

▶ **Boeing Award Comments**—Industry speculation on outcome of the long-range interceptor competition has grown noticeably more cynical in recent weeks, probably as a result of the way in which USAF disposed of the recent jet tanker problem. Fairly widespread caustic comments have been made because Boeing Airplane Co. won the $700-million plum (AW Mar. 7, p. 13), despite reports that other designs, notably that of Lockheed, may have been superior.

"There doesn't seem to be much doubt," said one airframe manufacturer, "that there are factors outside of straight merit that help determine the decision. It may be that certain plants have to be kept in operation, but it is a blow to find that the best design doesn't win because this bears weight in the decision."

There is evidence that USAF already has become sensitive to this type of comment and firm denials are made when the possibility is raised that none of the new aircraft proposals submitted in the long-range interceptor competition will be accepted.

▶ **Questions by Industry**—Specifications set up by USAF for the new aircraft include a speed of Mach 2 and combat radius of 1,000 mi. It will carry advanced electronic gear and armament for detection and destruction of enemy aircraft. The interceptor will have a two-man crew.

Some industry observers question the validity of the requirements, particularly for speed and altitude. Mission of the aircraft, it is clear, is not that of the ordinary interceptor that is expected to engage in dog fights with other planes.

Instead of tangling with other fighters, its mission would be that of what the Air Defense Command now calls a bomber-destroyer, a flying platform from which the Air Force can shoot down big and fast enemy planes on strategic missions.

▶ **Early Warning Factor**—For this reason, it is pointed out, the aircraft will have a big advantage over the traditional fighter once it is armed with the latest air-to-air missiles, themselves capable of seeking out the target.

Another factor, cited by those who question the need for long combat radius, is the practical ability of USAF to provide sufficient early warning for the long-range interceptor to contact the enemy at its maximum range of 1,000 mi.

NACA Reactor to Test Engine Parts

The $4.8 million nuclear aircraft engine research facility planned for erection by the National Advisory Committee for Aeronautics at a new site near Cleveland, Ohio, will include a reactor designed to test the effect of radiation on aircraft engine components and aircraft instruments and equipment.

Principal difference between the NACA materials test reactor and similar reactors now operated by the Atomic Energy Commission, Army and Navy is that it will be designed so that aircraft engine components can be tested to destruction without causing damage to the source of radiation. Dr. Hugh L. Dryden, NACA director, emphasized that this reactor was not aimed at providing power for nuclear aircraft engine research but only as a source of radiation for testing the suitability of possible fuels, coolants, structural materiels and aircraft equipment.

Dr. Dryden told the House Armed Services Committee that NACA had been able to duplicate the temperatures and pressures required for its atomic aircraft engine research at its Lewis Propulsion Laboratory at Cleveland but that this work was incomplete without studying the effects of large neutrons and gamma rays on the components, fuels and equipment under development .

The NACA reactor was approved by Atomic Energy Commission, USAF and Navy. It will be erected on a 500-acre site within a 50 mi. radius of the Lewis Laboratory.

Interceptor Avionics

USAF decision on a manufacturer to develop the avionics fire control and navigation equipment to be used in its long-range interceptor, like the airframe itself, has been hanging fire for months. One reason for the indecision reportedly is that few firms have been able to offer anything approaching the long-range radar which the Air Force believes the interceptor will require. Leading contenders for the avionics system include: Hughes Aircraft, North American Aviation, Radio Corporation of America, Westinghouse Electric Corp. (Air Arm Division), and Philco Corp.

Gross Warns Airframe Industry It Is Losing Weapon Business

Los Angeles—Lockheed President Robert Gross warned last week that the airframe industry is undergoing tremendous structural change due to invasion of the field by outside firms.

Airframe companies do not control aircraft production and design as they once did, Gross said in his first major address since becoming president of the Institute of the Aeronautical Sciences.

Technical advances and new concepts have brought other companies into the picture, he commented, noting that elevator, dental appliance, shoe and mining firms are among those now in the aviation field.

▶**New Names**—"How strange their names would have sounded in the aircraft industry 20 years ago," he added.

Of 22 major weapon systems now under development, only nine are controlled by airframe companies, Gross pointed out. Of the rest, seven are controlled by electronics firms, four by universities and two by automobile manufacturers.

While airframe companies will always control the air transport field, they are in danger of losing the aerial weapons business, he warned.

▶**Source of Problems**—"Shall we bend with the storm and see our industry splintered or face the wind and build more of the weapon systems ourselves," he asked?

He cited the growth of the guided missile field and technical advances such as new types of powerplants and automatic flight as reasons for the situation now facing the industry.

"We do not necessarily have within the geographic confines of the earlier airframe companies the people with all the skills now needed," Gross said. This has led the companies into passing some of their former prerogatives to outside firms.

▶**Loss of Influence**—Airframe companies, which once controlled up to 90% of aircraft manufacturing, must stand firm against this outside invasion, Gross insisted, or lose control of a large part of the aviation field.

Under the weapons systems concept, the aircraft no longer is the star of the show, he said, but is only one instrument in a vastly complicated apparatus. For this reason, the airframe manufacturer no longer exercises the influence he once did.

"A change has come in which there are not airframe companies, but aviation or aircraft companies," Gross warned.

▶**Engineer Support**—Development of aerial weapons belongs with the airframe companies, the Lockheed president asserted. His speech was regarded as a strong stand against the growing philosophy of passing out prime weapon system contracts outside the airframe industry.

With the industry facing bitter competition, it needs full support from its engineers, Gross said. Among the problems which need full attention, he listed:

- Drag reduction problems at high supersonic speeds.
- Boundary layer control.
- Reduction of the effects of clear air turbulence, particularly at high speed at high altitudes. A passenger should be able to take a 2-3G displacement at 300-500 mph. without discomfort, he said.
- Extension of range and reduction of weight by use of exotic fuels which promise 30-40% more range.
- Development of a better and larger family of engines in both the turbojet and turboprop fields.
- Use of nuclear power for flight. "Can we do something about shielding?" he asked. "We've got an atom-smasher; can't we make an atom-bender?"
- Use of highly complex computers to get qualitative and quantitative answers on new designs in a few minutes, thus quickly pointing the path to optimum designs.
- Development of an engineering-manager type. "We find when we want to reward a qualified engineer with a manager-type job he usually is not suitable." The engineer is at his best in a creative job, Gross said. "When you reward him with more responsibility, you put him in work he is not qualified to do. If you don't put him in a management job, how do you reward him?" The answer, said Lockheed's president, is the development of a well-rounded engineer with management qualities.

Industry Growth

Los Angeles—Lockheed studies predict a slow steady rise in the aircraft, missile and electronics industries over the next 15 years. Lockheed President Robert Gross told the Institute of Aeronautical Sciences that spending in these fields will follow this pattern:

1955	$7½-8 billion
1960	$ 9 billion
1965	$12½ billion
1970	$14½ billion

Aero Medical Meeting

Forum Reports on Human Factors

The Aero Medical Assn. spoke of mice and men at its 26th annual meeting in Washington last week.

The mice had developed gray hairs in their black coats because of high-altitude exposure to primary cosmic radiation.

The men were afraid of flying, or needed better instrumentation displays or hated the chafing of standard-issue oxygen masks.

▶**Sled Rides**—Between the technical sessions of the three-day meeting, delegates had a chance to ride a miniature deceleration sled to an 8G peak or to examine the latest items of personal equipment of USAF, Navy and RCAF pilots, among more than 40 exhibits of the latest professional aids and developments in this rapidly growing specialty field.

Two panel discussions and 38 papers were presented to more than 1,000 delegates and visitors to the Aero Medical meeting.

Specific highlights:

- **Completely automatic** emergency escape technique, developed by Navy for VTOL aircraft, has shown great promise in dummy ejections from planes, rocket-propelled sleds and hovering helicopters. Cmdr. Roland A. Bosee and W. C. Buhler of U. S. Naval Parachute Unit, El Centro, Calif., suggested the installation of the new system in all single-seat aircraft with ejection seats to reduce the number of post-ejection fatalities.
- **Aerodynamic limits of flight** at the upper border of the atmosphere were defined by Dr. Walter R. Dornberger, guided missile consultant at Bell Aircraft. Altitude limit was set at about 290,000 ft., with minimum and maximum flight speeds limited by available lift and aerodynamic heating respectively.
- **A prototype space ship cabin** has been built for the USAF to test the characteristics of a sealed system which carries its own atmosphere from the start of the flight. Such a cabin has no altitude limit. It was described by Dr. Hubertus Strughold, chief of the U.S. Air Force's Department of Space Medicine.
- **The gray-haired mice** were exposed to radiation at altitudes as high as 97,000 ft. for periods up to 18 hr., said Maj. David G. Simons, and Lt. C. H. Stein-

metz of USAF Aero Medical Field Laboratory, Holloman AFB, N. M. The mice flights were part of a program to determine the effects of primary radiation on animals. Post-flight examination showed the mice developed gray hairs at an unexpectedly high rate.

• **The G-suit** can help fight fatigue by being inflated at random intervals to provide some measure of relief, reported five scientists from the USAF Aero Medical Laboratory, Wright-Patterson AFB, Ohio. Tests made with a grounded F-84 cockpit for simulated flights up to 56 hr. duration showed the G-suit to be an effective aid, along with a dynamic cushion which inflates and deflates to apply pulsation to the pilot's buttocks. Conclusions: Present cockpit layouts and items of personal equipment except the oxygen mask are efficient enough to permit flights of extreme duration. The oxygen mask has been reported to chafe, to smell, to induce heavy perspiration and skin irritations.

Allison Expanding Turbine Facilities

Allison Division of General Motors Corp., will spend $75 million of its own money for new engineering, research and testing facilities designed to assist in the development of new high performance turboprop and turbojet aircraft engines.

The project was disclosed by GM president Harlow H. Curtice in a statement before the Senate Banking and Currency Committee.

▶ **Defense Criticism**—In addition to the fact that the new facilities will be privately financed and devoted largely to work on military engines, added significance was seen in the fact that the Defense Department has been increasingly unhappy with the speed of turbine engine development.

Improvement of Allison's facilities will include these features:

• Area devoted to engine research will be increased from 500,000 to nearly 1 million sq. ft.

• Employes in engine development will be increased 40%.

• Program will be completed in 1959.

"We are undertaking this project involving a large expenditure of our own funds," Curtice said, "to provide for the development of forward products to meet the needs of the armed forces as we anticipate them.

▶ **Industry Requirement**—"The advancement in design and performance of gas turbine aircraft engines is progressing at an ever-increasing rate. Engines in production today cannot meet the requirements of the aircraft of tomorrow where ability to operate at supersonic speeds and very high altitudes will continue to be demanded from engine builders. . . ."

Renegotiation Act Extension Likely

Pending passage of legislation extending the Renegotiation Act, now considered a certainty since President Eisenhower asked Congress to approve the bill earlier this month, all defense contracts include a provision that they will be subject to the law and the terms passed on to subcontractors. The clause is retroactive to Jan. 1 when the act was allowed to expire.

Frank L. Roberts, Renegotiation Board chairman, told AVIATION WEEK the military services, particularly the Navy and Air Force, are strong supporters of proposals now before Congress providing for extension of the board's life.

▶ **Problems**—Roberts said that since 1951 the board has found excess profits of $232,005,643 in defense contracts held by 1,721 manufacturers.

High interest of aircraft procurement officials in seeing the act renewed is based on practical problems such as these:

• **Supersonic planes and guided missiles,** by their nature, require long lead times and make it difficult to reach close initial pricing.

• **Widespread subcontracting,** much of it for components that are growing more specialized and complex, cannot be covered for protection of the government in any way except through renegotiation.

In his message to Congress recommending extension of the Renegotiation Act of 1951, President Eisenhower touched on these matters, adding that the general complexity of defense supplies and the necessity for contract alterations also help to make renegotiation necessary.

The White House also pointed out that substantial sums will be paid out in the next two years to build USAF to 137-wing strength in addition to aircraft to be bought for the Navy and Army.

▶ **Recaptured**—Figures on how much the board has recovered from industry through its activity since 1951 were disclosed before the congressional committee holding hearings on Independent Offices Appropriations for 1956. Under ordinary circumstances, the board does not publicize its "profit" in recaptured dollars, preferring to rely on its very existence as a factor in restraining manufacturers from the temptation to overprice what they are selling the government.

Highlights from the board's testimony presented to the congressional committee:

• Two regional offices, at Washington and Boston, have been closed and their case load shifted to the office in New York.

• There are 8,000 contractors subject to renegotiation who have failed to file reports. Justice Department action is imminent in some of these cases. Most of them involve subcontractors.

• In 1954, the board found excessive profits of $130,085,311 in the accounts of 1,077 contractors. The largest amount recovered from a single contractor was $20 million.

• Four contractors made voluntary refunds totaling $5,510,000 to the government in Fiscal 1954.

U. S. Army Accepts First DH-Canada Otters

U. S. Army has accepted six of 90 de Havilland-Canada Otter utility planes, now designated U-1. First U-1s are going to the Army Corps of Engineers for use as supply planes in Alaskan and Caribbean topographical surveys. They are painted in Arctic colors: white with high-visibility-red wingtips and tail. Subsequent U-1s will go to Transportation Corps Troop companies. Army ordered the new planes following evaluation at Ft. Bragg, N. C. Navy is getting four Otters, designated UC-1.

Southwest Wins 'Test' AF Overhaul Contract

First contract to a private service-type facility, covering overhaul of 1,290 Allison J33 turbojet engines, will be signed early this week by USAF's Air Materiel Command and Southwest Airmotive Co., Dallas, Tex. Amount of the contract, covering work in Fiscal 1955 and 1956, is $2,171,321.

An AMC spokesman said the departure from contracting with engine manufacturers for all outside overhaul work is part of an effort to spread the skills necessary over more of industry so it will be available in case of national emergency. USAF will keep its own depots in operation.

▶ **$1,600 Per Engine**—Southwest Airmotive's contract is in two parts, covering the program for the remainder of Fiscal 1955 and the next year. The first part provides for overhaul of 60 engines for $118,003. For Fiscal 1956, the deal will cover 1,290 engines at a cost of $2,053,318. The price will average out, according to AMC, to about $1,600 per engine.

USAF said contracts covering overhaul of jets by commercial operators have been delayed by lack of suitable facilities, a situation attributed to the fact that no jets are in commercial service. Southwest is reported to plan an investment in tools and equipment, plus a program to have its technicians trained in jet overhaul procedures with USAF personnel.

▶ **Test Run**—The J33 was chosen for what the Air Force calls a "test run" partly to set up reserve USAF overhaul capacity for later type power units.

A spokesman said several firms are interested in entering the field but it will be more than a year before any further action is taken because Southwest's capacity is sufficient for the immediate future.

Manufacturers also will continue to provide contract overhaul services.

3 Carriers Divide USAF's Engine Lift

First phase of Air Force's global aerial logistics system (AW Feb. 21, p. 133) will start operating Apr. 1 following the award of three contracts to carry aircraft engines to overseas bases for an initial three-month period.

Contracts totaling more than $1-million were awarded to:

- **Overseas National Airways** to fly ten round trips a month between San Bernardino Air Materiel Area (Norton AFB, Calif.) and Tachikawa, Japan, Far East Air Forces depot. ONA will use DC-4s. Amount of the contract is $490,000. Per plane-mile rate is $1.1458.
- **Flying Tiger Line** to fly seven roundtrips a month from Wright-Patterson AFB, Ohio, to Burtonwood, England, Chateauroux, France, and Nouasseur, French Morocco, FTL will carry J47 engines in DC-4s. Cost is $290,000 with a per plane-mile rate of $1.45.
- **Slick Airways** to fly seven roundtrips a month from the Oklahoma City AMA (Tinker AFB Okla.) to Alaskan Air Command bases and Northeast Air Command bases in Greenland. Slick will carry Allison J35 engines in its DC-6As. Payment will be $275,000 with a per plane-mile rate of $2.003.

There were eight carriers bidding for the three contracts with four bids submitted for the Japan airlift, six bids for the airlift to Alaska and Greenland, and four bids for the airlift to Europe and North Africa.

▶ **Rock-Bottom Prices**—Unsuccessful bidders were: California Eastern Aviation, North American Airlines, Seaboard & Western Airlines, Transocean Air Lines, and U. S. Overseas Airlines.

No bids were submitted by scheduled domestic trunklines or international carriers.

The per plane-mile rates were rock-bottom, observers said. Bid requests for airlift needs starting in July will be issued soon by the Air Materiel Command, Dayton, Ohio.

The carriers winning the awards are meeting with Military Air Transport Service to arrange schedules. The operations will be controlled by MATS.

▶ **DEW Airlift**—In other airlift developments, USAF reported that Douglas C-124s from Tactical Air Command are operating from an RCAF station at Edmonton, Canada, flying equipment to points in the Canadian arctic in support of the distant early warning (DEW) line under construction there. The C-124s are augmenting airlift contracted for with various Canadian commercial carriers and are ferrying equipment which cannot be handled by the Canadian carriers.

Other Air Force transports will be used in DEW line support this spring and summer, operating from Churchill, Manitoba, and Mont Joli, Province of Quebec.

Emergency requirements for carrying 268 tons of supplies to Iceland resulted in the award of short-term contracts by MATS to Overseas National, Seaboard & Western and Flying Tiger.

Aviation Gasoline Bids Asked

Bids for 20,185,300 barrels of aviation gasoline for the first half of fiscal 1956 were asked last week by the Armed Services Petroleum Purchasing Agency.

Total is "roughly the same" amount being purchased in the current fiscal period, Col. Arnold C. Gillman, ASPA director said. Aviation gas is purchased on a six-month basis. Requirements for the second half of Fiscal 1956 have not been determined.

Here is the breakdown of requirements of the four grades by aviation gas by areas:

(in thousands of barrels)

Areas	115/145	100/130	91/96	80
East Coast				
Navy	1,055.8	102.7	136.3	2.4
Coast Guard	.....	.....	1.4	...
Air Force	1,731.2	465.2	22.3	2.4
Total	2,787.0	567.9	160.0	4.8
Gulf Coast				
Navy	1,384.5	374.2	329.9	.3
Coast Guard	2.9	2.2	1.6	.2
Air Force	2,996.4	1,616.9	494.9	24.2
Total	4,383.8	1,993.3	826.4	24.7
Inland				
Navy	92.8	356.0	8.4	...
Coast Guard	1.1	.....	.8	...
Air Force	1,274.5	823.6	92.7	1.5
Total	1,368.4	1,179.6	101.9	1.5
West Coast				
Navy	2,365.6	137.7	137.0	...
Coast Guard	.....	.....	.5	...
Air Force	2,809.0	1,231.4	97.4	7.4
Total	5,174.6	1,369.1	234.9	7.4
Total				
Navy	4,898.7	970.6	611.6	2.7
Coast Guard	4.0	2.2	4.3	.2
Air Force	8,811.1	4,137.1	707.3	35.5
Grand Total	13,713.8	5,109.9	1,323.2	38.4

3 Firms Report Profits of $20-Million Plus

Led by United Aircraft Corp., the nation's aviation industry last week continued the spring flow of annual reports on their business in 1954. Other companies issuing statements included Kaman Aircraft and the Glenn L. Martin Co. General Dynamics issued its earning figures in a news release pending publication of the complete report in a few weeks. (For annual reports by Boeing Airplane Co., Lockheed Aircraft Corp., Curtiss-Wright Corp., and Chance Vought Aircraft, Inc., see p. 25.)

United Aircraft

United Aircraft Corp., East Hartford, Conn., had a net income of $25,996,232 in 1954, equal to $7.65 a common share in addition to the usual $5 a share on preferred stock. Sales for the year were $654,239,961, down from $690,758,145 in 1953.

The 1953 sales figure has been adjusted to allow for activity of the Chance Vought Aircraft Division, which became a separate corporation Jan. 1, 1954. The 1954 net compares to $21,193,733 in 1953, including the Chance Vought income, equivalent to $6.22 a common share.

▶ **Lower Military Profit**—United said the gain in 1954 net profits was due to the end of the excess profits tax. Income before taxes was down, the report pointed out, because of reduced commercial sales and lower profit on military business.

The corporation's backlog at the beginning of this year was $1,375 million, up from $1,160 million a year earlier.

This includes orders on the books of all divisions.

Highlights from the United report:

- Pratt & Whitney's 1954 shipments were 55% gas turbine engines, with the 10,000-lb. thrust J57 in its third year of production. More than 1,000 of these engines have been produced.
- The advanced J75 is in full scale test and other new projects are under way at Pratt & Whitney for the Air Force and Navy.
- Work on the atomic-powered engine, started in 1951, is on schedule. Starting in 1957, Pratt & Whitney will operate USAF's new Connecticut Aircraft Nuclear Engine Laboratory at Middletown.
- Production of the J48 jet will be resumed this year to power Navy F9F-6 and F9F-5 carrier fighters.
- Hamilton Standard's diversification program, started to offset the loss of propeller business with the advent of jet engines, is progressing. In 1954 the division doubled its shipments of aircraft equipment. Plant area has been expanded.
- First production units of the twin-engine Sikorsky S-56 helicopter, will be delivered late this year for Marine and Army use. A new 800,000-sq.-ft. plant, that will more than double present company capacity, will be opened in Stratford this summer to produce the S-56.
- There are no production orders for the turbine-powered S-59 helicopter, but the division believes the market will develop.
- The Research Department this year will start using new transonic and supersonic windtunnels as well as a new electronic computer.

Martin Aircraft

Glenn L. Martin Co., Baltimore, Md., reported 1954 sales of $270,729,973, an increase of 30% from the previous year's $208,006,538. Military services took 99% of the year's output.

Earnings for the year were $20,052,315, compared with $15,094,756 for 1953. The 1954 net was equal to $7.85 a share.

The company's backlog at the beginning of 1955 was about $600 million, slightly higher than a year ago, and covered contracts running into 1957.

▶ **Finances**—The Martin report emphasized improvements made in the company's financial position. A $10 million loan, taken commercially to cancel a V-loan debt, was paid off and the firm at the end of the year had $32 million in cash and short-term investments.

President George M. Bunker said the Martin management plans to stay in a strong cash position for three reasons:

- To finance new contracts that may grow out of advanced design work.
- To cut the amount of progress payments in accordance with Defense Department policy.
- To invest in laboratory facilities to expand engineering work and development of new materials and manufacturing techniques. More than $5 million has been appropriated for this work.

Bunker said advanced engineering would be responsible for future success and that the Martin effort in this line is the most intensive in its history.

General Dynamics

General Dynamics Corp., major unit of which is Convair Division, had net earnings of $20,795,472 in 1954 John Jay Hopkins, president, reported.

For comparison, it was reported that in 1953 the combined net of General Dynamics and the former Consolidated Vultee Aircraft Corp., was $13,193,866.

Net sales of General Dynamics in 1954 were $648,641,241, a 12% gain over the combined sales of the two companies of $577,347,511 in 1953.

After giving effect to a two-for-one stock split announced earlier this month, General Dynamics earned $4.72 a share for 1954.

Backlog at the end of 1954 was more than $1 billion.

Kaman Aircraft

Kaman Aircraft Corp., Bloomfield, Conn., had net earnings of $344,046 in 1954 compared with $206,853 the previous year. Income rose to $13,395,242 from $11,646,236. The company paid its first dividend of 10 cents a share last December.

All of Kaman's helicopters are for the military services. During 1954 a new research and test facility, built by the Navy, was opened. The company also flew the first drone helicopter and the first helicopter powered by twin gas turbines.

Convair Windtunnel

Work on a new $3,500,000 windtunnel to test aircraft and guided missile models up to four and a half times the speed of sound will be started in San Diego this year, according to Joseph T. McNarney, president of Convair.

The windtunnel is included in an $8 million budget approved for new plant equipment, engineering and laboratory facilities. It will be built on the Convair seaplane ramp. Construction will take two years.

Test section of the new tunnel will be four ft. sq. Storage tanks will hold at least 20,500 sq. ft. of air under pressure of more than 260 psi—equivalent to 17 atmospheres.

UAC Spending

During 1954 United Aircraft Corp.'s three divisions—Pratt & Whitney, Sikorsky and Hamilton Standard—bought parts and components from 7,000 subcontractors and suppliers.

More than 75% of these firms are in the small business category.

The subcontractors and suppliers collected from UAC about $340 million—more than 55% of its total expenses for parts and components.

Aeronautical Research Lag Cited To Support NACA Budget Increase

Testimony that the U. S. is lagging in aeronautical research and development and risking the possibility of the development of a "technological suprise" by the Soviet Union was presented to the House Appropriations Committee by members of National Advisory Committee for Aeronautics.

Supporting an $11.5 million increase in NACA's Fiscal 1956 budget for operation expenses to provide for the operation of three new windtunnels and increase the level of the research effort, Dr. Jerome Hunsaker, NACA chairman, made these two points:

• "In our opinion the design and development of new types of aircraft are not now adequately supported by basic research data. That means we are going a little bit faster than our knowledge. We sometimes are taking a chance in some of these new developments. The relatively little more research money will yield results of the value of many times the cost in improved airplanes."

• "We cannot know with certainty how well we are doing with respect to the Soviet. We like to believe that we still have a lead in quality, but we do know that the Soviet is accelerating its program, and we do know that aeronautical science in this country is suffering for a lack of funds sufficient to attack many scientific problems which appear as if they should be gone into."

► **'Technological Surprise'**—In addition to the acceleration of the Soviet aeronautical program, Lt. Gen. Donald Putt, USAF Deputy Chief of Staff for Research and Development, stressed this concern: "I think that right now in the next five or six years the Russians are perfectly capable of confronting us with a technological surprise—with a new military weapon in any particular area that they choose to devote their resources, their scientific brains, and their effort. They might not be able to beat us across the board, because we might have better engines than they have, and they might have better missiles then we have, but the thing we worry about most is the possibility of the technological surprise with a new weapon. The balance now of qualitative superiority in our weapons is such that I think the international situation could be changed dramatically if such an incident were to occur."

Vice Adm. Ralph Oftsie, former Deputy Chief of Naval Operations for Air and now commander of the Sixth Fleet, reported that the Navy is having difficulties in the high-altitude, high-speed operation of its aircraft similar to those confronted with USAF's F-100 (AW Mar. 7, p. 11). "We simply do not have the information which we should have" on the flow of air through jet engines, firing guns, and aircraft control, he declared.

New York's Airports Set Traffic Records

Greater New York's four civil airports handled a record 9,320,838 passengers during 1954 and processed peak loads of more than 122,000 tons of cargo and 40,000 tons of airmail.

In its annual report last week, the Port of New York Authority gave this breakdown:

• **Idlewild International.** Passengers increased 22% to 2,939,968; airmail gained 46.6% to 29,925,900 lb.; cargo totaled 87,135,700 lb., a 1.3% drop, and aircraft movements amounted 100,976, a 14.9% increase.

• **LaGuardia.** Airmail gained 9.5% to 44,001,000 lb., while cargo declined 9.9% to 99,874,500. Passenger traffic increased 3.7% to 4,909,840, and aircraft arrivals and departures totaled 203,572, climbing to 2.1%.

• **Newark.** All traffic totals topped those of previous years. Passengers increased 29.8% to 1,471,030; airmail was up 56.7% to 6,847,600 lb.; cargo gained 37.8% to 51,417,100 lb., and aircraft traffic totaled 95,331, an 18.5% increase.

• **Teterboro.** Aircraft movements, primarily business planes, increased 3.3% to 209,494. Cargo dropped 0.5% to 3,566 tons.

Fokker Requests U. S. Certification for F.27

The Fokker F.27, a leading DC-3 replacement contender, is being processed for certification by the Civil Aeronautics Administration. This is the first time CAA has processed a foreign-built airplane for U. S. certification.

Representatives of Fokker Royal Netherlands Aircraft Factories have met with CAA officials for preliminary discussions on the request for a U. S. certificate for its turboprop transport. Normally, CAA accepts certification of the country where an airplane is built, as it has with Britain's Vickers' Viscount.

The Netherlands company asked for a U. S. certificate because it feels the high reputation of such approval will improve sales. Also, if Fairchild Engine & Airplane Corp. completes plans to build the F.27 under license in this country (AW Dec. 27, p. 75), U. S. certification would be advantageous in speeding certification and acceptance of the Fairchild product.

Meanwhile, increased importation of foreign aircraft and expanding overseas operations of U. S. airlines calls for establishment of a new CAA post in Paris.

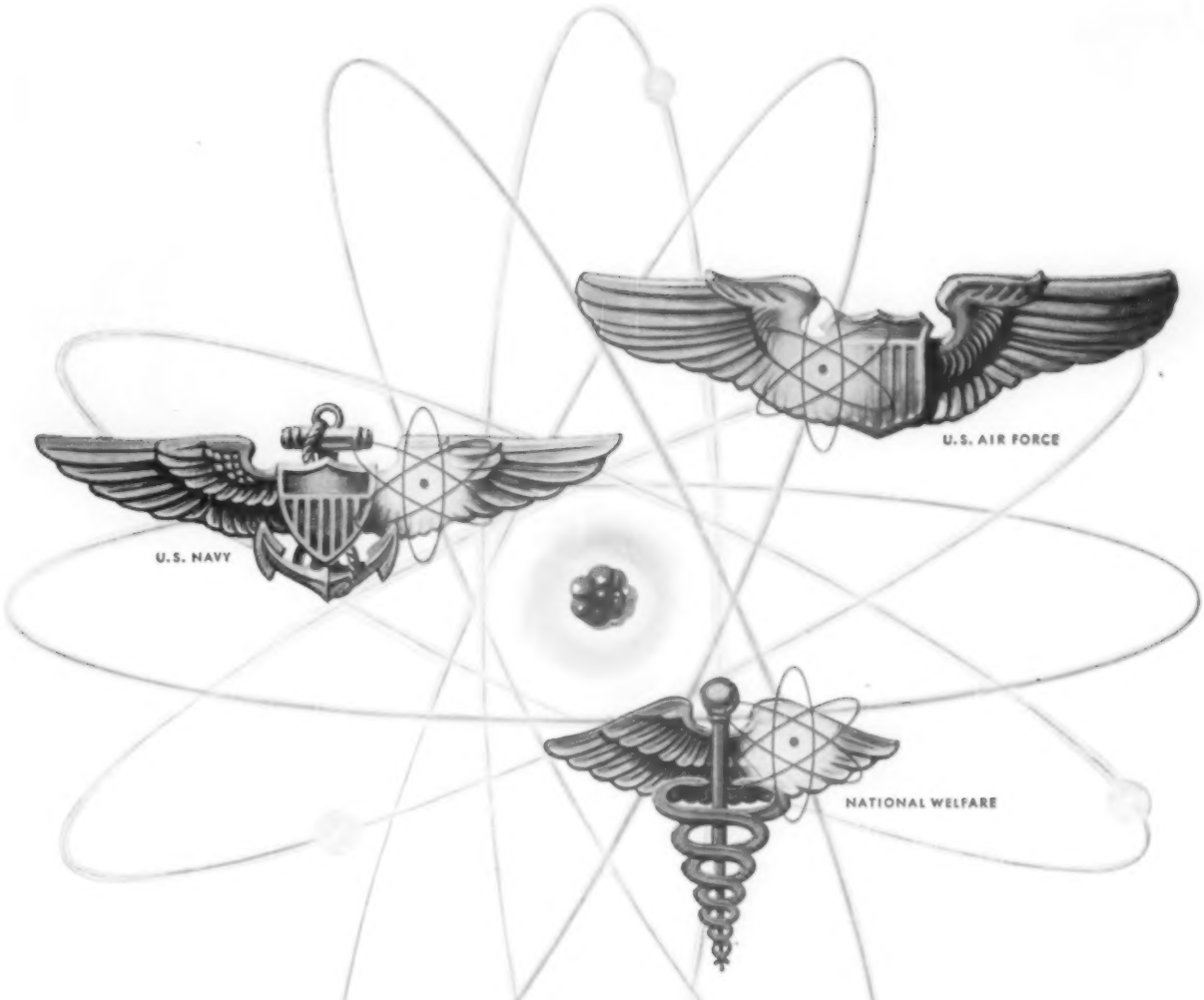
A new job of aircraft engineering advisor has been created to provide information to U. S. government agencies and American manufacturers and airlines, as well as foreign governments and manufacturers. The post will be held by Raymond B. Maloy, former chief of the CAA Flight Test Branch.

Aircraft Industry Backlog Drops 12%

Backlog of orders for complete aircraft, engines and propellers as of Dec. 31, 1954, declined 12% below the orders on hand at the end of 1953.

Backlog for quarter ending:

	Dec. 31, 1953	Mar. 31, 1954	June 30, 1954	Sept. 9, 1954	Dec. 31, 1954
			(In millions)		
Total	$16,752	$16,100	$15,247	$14,865	$14,769
Completed aircraft and parts	11,610	11,383	10,679	10,486	10,625
U. S. military	10,846	10,664	10,012	9,821	9,856
Other	764	719	667	665	769
Aircraft engines and parts	4,080	3,597	3,361	3,257	2,910
U. S. military	3,945	3,465	3,245	2,144	2,792
Other	135	132	116	113	118
Aircraft propellers and parts	218	193	206	202	190
U. S. military	191	169	180	174	165
Other	27	24	26	28	25
Other products and services	844	927	1,001	920	1,044



Atomic research at **CONVAIR** is sprouting wings

Convair's engineers and nuclear physicists are making bold strides toward the flight of atomic-powered aircraft.

At Fort Worth, with the largest staff of its kind in the industry, Convair is operating the first U. S. Air Force atomic reactor and laboratory. And at San Diego, Convair engineers are working toward the adaptation of nuclear energy for the development of other weapons systems.

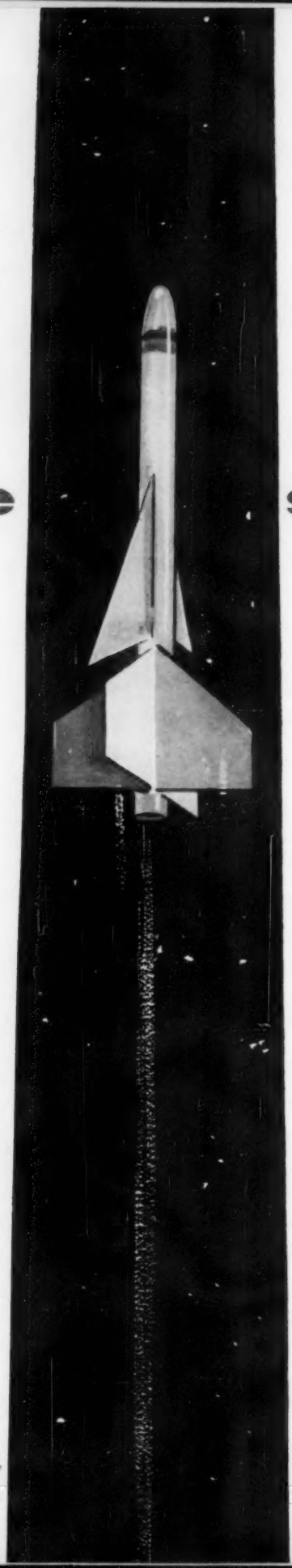
Convair has a unique advantage in turning the atom into motive power for aircraft by interchange of data with Electric Boat Division of General Dynamics Corporation, and builder of the U. S. S. Nautilus, first atomic-powered submarine.

Atomic research at Convair is sprouting wings . . . wings for the nation's defense and welfare.

ENGINEERING TO THE *Nth* POWER...*NUCLEAR POWER*

CONVAIR

A DIVISION OF GENERAL DYNAMICS CORPORATION



positive simple design...

. . . provides the utmost in locking dependability

makes possible the

LIGHTEST • STRONGEST • SMALLEST

self-locking nuts

KAYLOCK

TRADE MARK

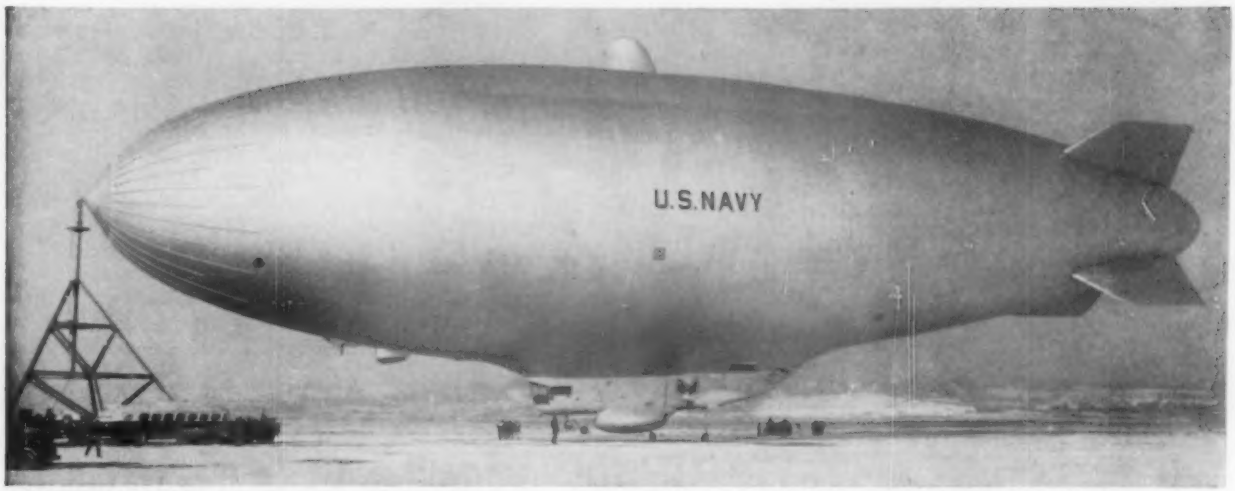
developed to meet the high standards required in modern aircraft

Kaylock nuts are precision products, produced in full conformance with air force-navy specifications AN-N-5 and AN-N-10.

THE KAYNAR COMPANY

KAYLOCK DIVISION **BOX 2001, TERMINAL ANNEX**
LOS ANGELES 54, CALIFORNIA

Canada Distr.: Abercorn Aero Limited, Montreal



BIG BUBBLE ON TOP of Goodyear Aircraft ZPG-2W houses avionic equipment for detection of enemy bombers far from U. S. shores.

Blimps Join Navy Early Warning Team

By Henry Lefer

Akron—The non-rigid airship, a key weapon in the team that drove enemy submarines away from American coasts in World War II, has been adapted to the mission of giving early warning of the approach of enemy bombers.

Goodyear Aircraft Corp.'s ZPG-2W, first of the AEW (aircraft early warning) blimps, made its first flight last month, and more have been ordered by Navy. These airships will supplement heavier-than-air picket aircraft such as Lockheed's WV-2 Super Constellations.

Cost per pound for airships and aircraft performing comparable missions is estimated to be about equal by GAC spokesmen.

▶ **Endurance Record**—The ZPG-2W is a sister ship of the ZPG-2 which last year set a sustained-flight-without-refueling record of more than 200 hours, Equipped for refueling and reballasting in flight, one of the few limitations hereafter would be endurance of the 21-man crew.

AEW detection equipment is housed in a huge glass-plastic radome atop the airship's back. This big bubble is connected with the car below by a 75-ft. vertical rubberized tunnel running through the airship's envelope. There are two ports in the AEW radome, but whether the structure is occupied by a crewman during flight has not been revealed. In addition, the ZPG-2W carries submarine detection equipment in its big belly radome.

Length of the ZPG-2W is 342 ft. and capacity is 975,000 cu. ft. of helium. Power comes from two Wright R1300 piston engines with a normal rating of about 700 hp. that can drive the ship at about 70 knots. The two 18-ft. Curtiss Electric props are three-blade, full-feathering, controllable-pitch and reversible. Props are mounted on outriggers projecting from each side of the control car.

One of the features of airships that fascinates Navy planners is that helium provides the lift. Engines are used primarily to push the craft forward. As a result, only about 1 hp. is needed to push 80 lb. of load. In an airplane the ratio is close to 1 hp. to 10 lb. The blimp can hover or travel at relatively slow speeds. Engines can be throttled back to provide just enough power to maintain headway. As a result of the "free" lift and small engines, fuel consumption is low, compared with heavier-than-air craft. A fleet of AEW blimps remaining on station for a week or longer with new refueling techniques, could move back the protective curtain around the U. S. perhaps by hundreds of miles.

▶ **High Availability**—In World War II operations, airships assigned to fleet units recorded 87% availability—in operation or in readiness for operation. The airship fleet made nearly 56,000 flights and spent 550,000 hours in the air. None of the 89,000 ships they escorted during the war was lost.

Blimp missions in World War II were directed primarily against submarines. As they joined the service in growing numbers, they drove the Nazi U-boats off the relatively shallow Atlantic shelf out into deep water.

When Japan attacked Pearl Harbor, the Navy had 10 blimps of all types in operation, but only six large enough for service at sea. The Airship Service comprised 100 aircrewmen and 100 pilots (including retired, reserves and students). At the peak of the U-boat war, more than 120 airships, 1,500 pilots, 3,000 aircrewmen, and 8,000 administrative personnel were in the ship-airplane-airship anti-sub team. The number of merchant ships sunk in Atlantic coastal areas dropped from 454 in 1942 to eight in 1944.

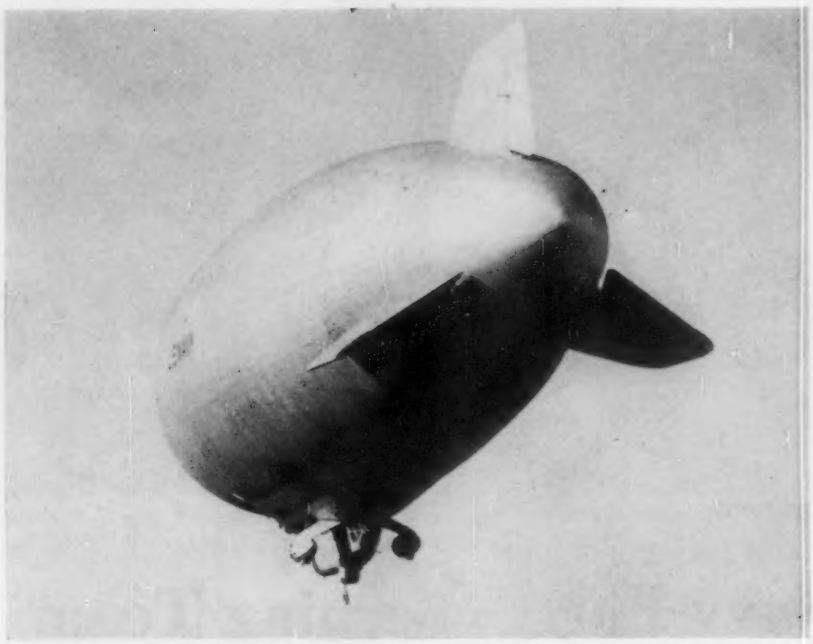
As the war neared its end, the Germans threw snorkel submarines into the fight against coastal shipping on the approaches to Britain. A blimp squadron was readied for the move to an English base when the German High Command surrendered, so there was no contest between the airship and this more-deadly submarine.

However, airship men claim that the blimp, with its ability to hover and to carry more and larger types of detection

LTA Designations

Navy recently introduced new designations for its lighter-than-air craft. Old and new names are shown below.

Old	New
Word War II	
ZP2K	ZSG-2
ZP3K	ZSG-3
Postwar modifications	
ZP3K (later ZP4K)	ZSG-4
Postwar developments	
ZP5K	ZS2G
ZPN-1	ZPG-1
ZP2N	ZPG-2
ZP2N-1W	ZPG-2W



INVERTED Y-TAIL on XZS2G-1 'scout' ship is designed to shed snow loads.

equipment than the airplane, is superior to its teammate as sub-spotter. With the latest developments in magnetic and other detection devices, they say it is more than a match for the snorkel sub.

▶ **Scout and Patrol**—Navy's anti-submarine airship fleet will hunt out the enemy with the latest in sonar, magnetic airborne detection (MAD) equipment and homing-type weapons. The fleet will consist of two major types of airship:

• **ZSG**, a "scout" type with intermediate duration of about 24-36 hours. Helium capacity is 527,000 cu. ft. Latest of the S ships is the XZS2G-1, which will be delivered soon to Navy. This ship exchanges the usual cruciform tail, with horizontal and vertical control surfaces, for an inverted Y-tail.

• **ZPG**, a long-range "patrol" type, has control surfaces (ruddevators) set at 45 degrees from horizontal and vertical. This type is a postwar development.

To permit access to the giant radome that houses the belly gear, the bottom section is made of rubberized fabric with a zippered manhole. The radome is pressurized to maintain acrodynamic contour in flight.

All S ships from the ZSG-4 onward are postwar modifications or developments.

▶ **Tail Techniques**—Although a blimp can take off straight up, when heavily loaded it requires a takeoff run. This is awkward with the old-style tail arrangement. As the nose goes up, the tail may drag on the ground. To get around this, Goodyear Aircraft designers moved the control surfaces in the ZPGs to the 45-degree position. This simplified control problems at the same time.

However, it introduces the problem of snow collecting in the trough formed between the two upper ruddevators and the airship body. An answer to this is the inverted Y-tail carried by the XZS2G-1.

▶ **Structure**—The airship envelopes, Neoprene-coated cotton, are made at GAC's Litchfield Park, Ariz., plant. The cars and metal structure for the nose and tail are fabricated at Akron. Assembly is at Akron.

Helium is carried in gas bags in the envelope. In addition, there are two ballonets along the belly of the ship which carry air. By varying the quantity of air in the ballonets, the buoyancy of the nose or tail is changed, providing a system for controlling the airship's altitude and attitude.

The car is attached by steel cables to steel catenaries which run along the top and bottom of the ship. The car itself is made of Bondolite, a Goodyear sandwich material. In the ZPG-2W, Bondolite consists of aluminum alloy sheet with a balsa wood core. Other types of Bondolite have aluminum foil, paper, fiber glass or foamed plastic centers.

The ZPG-2W's control car is a double-decker, with crew quarters and galleys above and operational stations on the lower deck. Flight controls may be controlled manually or by autopilot. Tricycle landing gear is used.

Helium in the gas envelopes is maintained at 0.7 psi. pressure differential from atmospheric. It is this slight pressure that keeps the envelope filled out to its familiar shape.

Airship proponents say the blimp can operate in any kind of weather that airplanes can. It can take off and land, with the aid of radar, in any visibility condition. It requires no very great landing facilities, but can operate from a portable mooring mast.

Goodyear gets helium for its own two blimps in 200,000-cu. ft. tank cars at a price of $30 per 1,000 cu. ft. By means of the air ballonets and by keeping within optimum operating altitudes, the amount of this costly helium that is lost by valving off is small. The old Hindenburg, a 7-million-cu. ft. dirigible, valved off as much as 1.5 million cu. ft. of hydrogen in the course of an ocean crossing.

CAA to Get Data On Jet-Assisted C-46

Flight test data covering a specially modified Curtiss C-46 fitted with twin auxiliary jet powerplants now only awaits compilation and checking prior to being submitted to Civil Aeronautics Administration for approval.

The data will be transmitted to CAA by Transocean Air Lines. The airline has been handling the flight test side of the project jointly with El Al Israel Airlines, which owns the copyright and engineering rights to the assist-jet installation.

The pods are mounted side-by-side beneath the C-46's belly. Each contains a Turbomeca Marbore 2 turbojet rated at approximately 900 lb. thrust to increase the plane's takeoff weight by 10,000 lb. The installation also improves single-engine and high-altitude performance.

U.S. Experts to Attend Dutch Copter Meeting

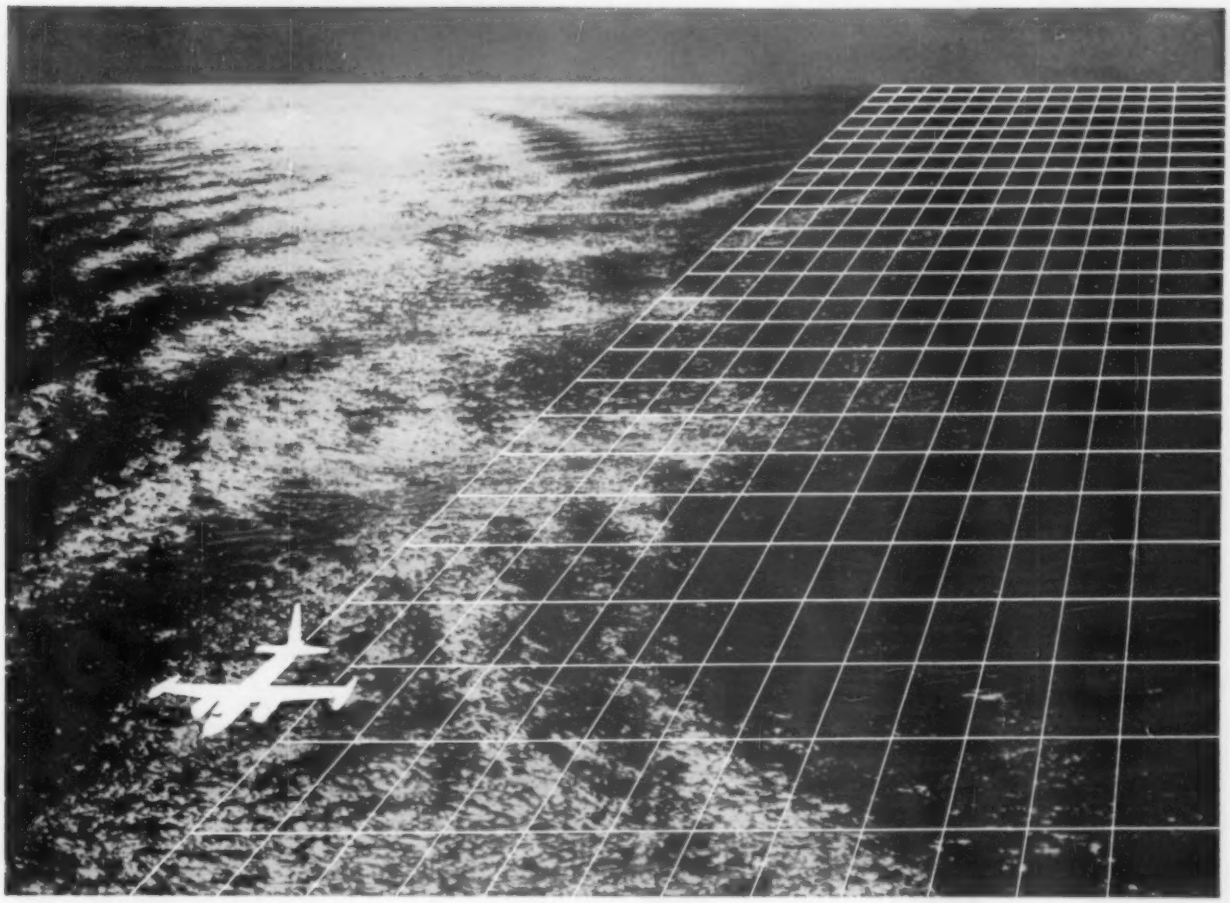
Four U.S. helicopter experts, representing both manufacturers and commercial operators, will take part in a three-day conference on rotary-wing and heliport problems in Rotterdam, Holland, July 27, 28 and 29.

Sponsored by the Rotterdam Helicopter Syndicate, the meeting will be held in conjunction with the Rotterdam National Exhibition.

▶ **Speakers**—Papers on commercial aspects will be given by Clarence Belinn, president of Los Angeles Airways and Robert L. Cummings, Jr., president of New York Airways.

Frank N. Piasecki and Sergei Sikorsky will speak on technical aspects.

Other speakers will include Louis Breguet, French aircraft designer and helicopter pioneer; G. S. Hislop, chief designer of Fairey Aviation Co., and M. Naome, chief of the helicopter department of Sabena, Belgian airline.



Manhunt

on a grid etched in the ocean!

The ocean isn't trackless any more.

Today, rescue planes anywhere on the seven seas — at any distance from a shore check point — can fly a search pattern as precise as a grid laid out on land. In fact, the grid is literally etched by electronics on the face of the globe. Search runs *by the same plane* can be flown along exactly parallel lines.

A new navigation unit with a cybernetic brain, developed by General Precision Laboratory in cooperation with the Air Force, links plane course with grid course. It is never fooled by shifting winds, nor fazed by absence of sun, stars or radio beams. Ceiling can be down on the deck, but the search goes along grid lines like flanged wheels on rails.

With inexhaustible patience, this electronic brain keeps a mile-by-mile record of plane speed in climb, cruise or descent, in turbulence or still air . . . notes every shift in course, measures and remembers each variance in wind. It gives an exact fix, at any instant of flight.

Its uses are many, in precision flight free of ground communication. Search and rescue is an obvious one. And morale is higher when airmen know that if they are downed in the far reaches of a strange ocean, rescue planes will look for them with a device that follows signposts in the sea.

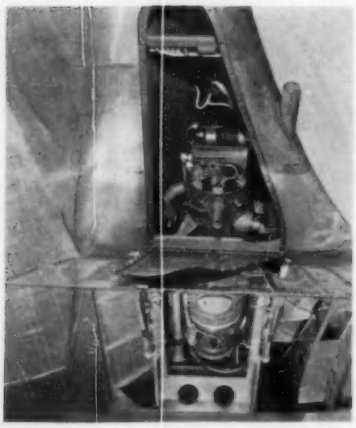
This device emerged from the advanced research and development work of GPL; it is typical of the challenge it offers engineers, the facilities it adds to the nation's might.

Engineers: Write for employment information

GENERAL PRECISION LABORATORY

INCORPORATED • PLEASANTVILLE, NEW YORK

A SUBSIDIARY OF GENERAL PRECISION EQUIPMENT CORPORATION



ON YOUR NEW SUPER-G

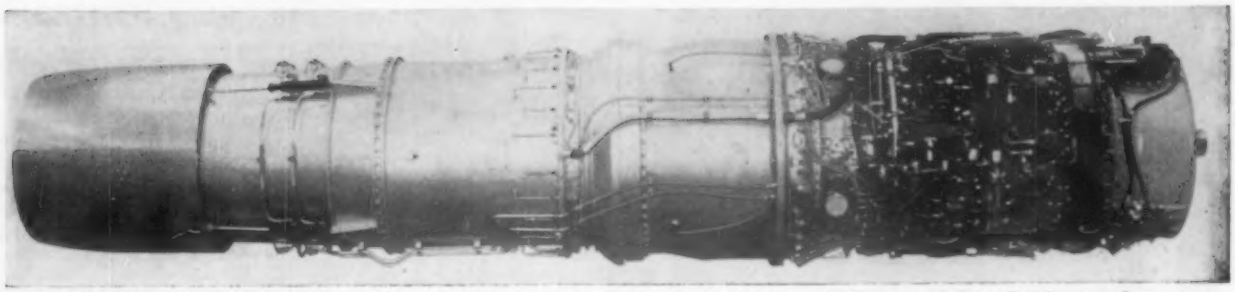
We're pleased to have contributed a measure to the success of your brilliant new Lockheed Super-G Constellations, with two 125,000 Btu heaters aboard. Both installations are in the wing fillets, one of which is shown in the photograph taken from the ground looking up.

Janitrol heaters put "heat where you want it" on the majority of commercial, utility and military aircraft. Janitrol products include heaters and heat exchange accessories for all aircraft.

Janitrol

AIRCRAFT-AUTOMOTIVE DIVISION
SURFACE COMBUSTION CORPORATION
Columbus 16, Ohio

District Engineering Offices: New York, 225 Broadway; Washington, D. C., 4650 East-West Highway; Philadelphia, Penna., 401 No. Broad St.; Kansas City, Mo., 2201 Grand Ave.; Fort Worth, 2509 Berry St.; Hollywood, Calif., 7046 Hollywood Blvd.; Columbus, Ohio, 400 Dublin Ave.



AFTERBURNER ON WRIGHT J65, configuration for Lockheed XF-104 and Grumman F9F-9, revealed in C-W's annual report.

Annual Reports Pinpoint Prosperity . . .

Aircraft Profits, Activities Continue Climb

Annual reports of aircraft companies continue to reflect the industry's high level of activity and profit in 1954.

Financial resumes were distributed by Boeing Airplane Co., Lockheed Aircraft Corp., Curtiss-Wright Corp., and Chance Vought Aircraft, Inc., which completed its first year as an independent producer after leaving the United Aircraft Corp. A fourth report was published by Minneapolis-Honeywell Regulator Co., major supplier of aircraft components.

Boeing

Boeing broke into the billion-dollar-a-year sales circle in 1954, first aircraft company to reach that goal. The total amount was $1,033,176,265. Net earnings were $36,976,023, equivalent to $11.39 per share on 3,246,436‡ outstanding shares. This compared with net earnings in 1953 of $20,318,178 or $6.26 per share on the present number of shares.

Backlog at the end of the year was about $2,131,000,000, substantially all of it in government contracts. This is a slight decrease from a backlog of $2,357,000,000 at the end of 1953.

► **Four Dividends**—Earnings in 1954 amounted to 3.58 cents per dollar of sales, compared with 2.21 cents per dollar of sales last year.

During the year Boeing paid four cash dividends totaling $3 per share with total dividends amounting to $9,729,122. A stock dividend of one share for each share held also was distributed.

Net worth of the company is $109,441,257 including an increase of $27,246,901 in 1954. Stockholders' equity was $33.71 per share.

Employment for the year averaged 65,054 with 36,251 employed at Seattle-Renton, Wash., and 28,803 at Wichita, Kan. Wages and salaries amounted to $300,244,415.

Other Boeing highlights for 1954:

- Award of an Air Force contract for the KC-135 tanker-transport.
- On-schedule production of the B-52 jet bomber at Seattle and Wichita.
- Progress on the IM-99 Bomarc surface-to-air missile.
- Delivery of the 1,000 B-47 medium jet bomber.

Lockheed

Lockheed earnings in 1954 were highest in the company's history—$22,446,000, equal to $7.94 for each share of stock. Sales volume was $732,872,000, down from 1953's record of $820,467,000, on which the firm realized $15,462,000, or $5.51 a share.

The 1954 sales were divided into military—$642,190,000, and commercial —$90,682,000. Backlog at the end of the year was $1,190,525,000. Paid out to stockholders during the year in dividends: $7,222,000.

For 1955, President Robert E. Gross predicts reduced profits because of heavy development expense and temporarily reduced manufacturing. He anticipates a quantity order for the USAF C-130 turboprop cargo transport, production of the F-104 jet fighter, the Navy T2V-1 two-place trainer and continued expansion of missile activity.

By division, the report gives this summary of the company's 1954 activity:

- **Georgia** (Marietta) sales up 14% to $224,538,000. This plant produces and modifies B-47 jet bombers of Boeing design. It also has started production of the C-130.
- **California** (Burbank, Bakersfield, Palmdale) sales dropped 20% to $472,667,000. Products are the Navy R7V-1, WV-2, WV-3, P2V-7, TV-2 and T2V-1; USAF C-121C, RC-121D, F-104A and T-33A; for commercial sales, the Super Constellation and for MDAP, the RT-33.
- **Missile Systems** (Van Nuys, Calif.) in its first year recorded sales of $7,212,000. This division has a backlog of nearly $30 million with six secret projects under contract.

The Lockheed report discloses that the company spent $500,000 working on a jet tanker design for the Air Force, a competition that ended with a production contract for Boeing and further design efforts for Lockheed, with the possibility that the company may build one or two prototypes. Another $150,000 has been spent on a design competition for a new USAF interceptor.

Other highlights from the report:

- Work is under way on an improved early warning picket plane using a new concept in radar antenna arrangement.
- A new Navy patrol plane design to succeed the P2V series is ready.
- USAF has "greatly enlarged" its contract for design of a nuclear-powered aircraft.
- A pushbutton type of aerial delivery for parachute dropping of weapons and materials has been developed.
- Manhours required to build a Super Constellation have been cut one-third.
- Proportion of work by subcontractors and vendors remained steady.

Curtiss-Wright

Curtiss-Wright reports 1954 sales of $475,084,435, compared with $438,728,482 in 1953. Profit after taxes increased from $11,402,791 to $19,377,279. Backlog at the end of the year was $662,000,000, down from $771,750,000.

Roy T. Hurley, president and chairman, says a program of diversification was pressed in 1954 with establishment of three new divisions. They are the Research Division, Curtiss-Wright of Canada, Ltd., and the Industrial and Scientific Products Division.

The two-year-old Specialties Division, Hurley says, has made good progress in the fields of nuclear, ultrasonic, plastic and electronic equipment.

Chance Vought

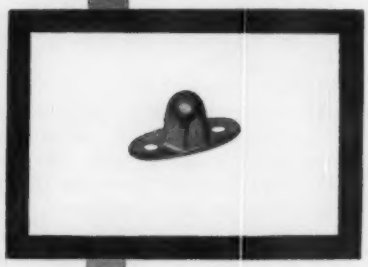
In 1954, Chance Vought completed its first year of independent operation. Formerly part of United Aircraft Corp.,

this nut
may solve
your
fastening
problem

NS-110 Stainless steel 1-8, self locking, floating anchor nut.

or

you
may need
this one



4605-40 steel #4-40 self locking fixed dome nut.

Self locking anchor nuts are solving many complex fastening problems, especially where corrosion, vibration and high temperatures exist. Whether your application requires a standard or special type, we can supply it in steel, stainless steel, titanium or aluminum; thread sizes 1-8 to 4-40. Write for booklet, SOLUTIONS TO FASTENING PROBLEMS on your company letterhead.

Nutt-Shel

811 AIRWAY, GLENDALE 1, CALIF.

MANUFACTURERS OF SELF LOCKING ANCHOR NUTS & BOLT AND NUT RETAINERS.

sales for the year of $149,627,125 were reported in the first resume of the company's activity. In years past, its figures always have appeared as part of the overall UAC financial report.

Chance Vought's net income was $6,640,433, equal to 4.4% of the total sales and $6.15 a share on common stock.

At the end of the year, the company says, it had a backlog of $188 million, to which $30 million has been added so far in 1955.

Highlights from the Chance Vought report:

- Delays in engine development have handicapped production of the F7U-3 Cutlass and caused cancelation of contracts for the attack version, the A2U-1.
- Production has increased on the Navy Regulus, surface-to-surface missile, and continued on components for the Boeing B-47 and Lockheed P2V.
- New projects include a high-performance guided missile, plus a new Navy day fighter, the XF8U-1, scheduled for first flight in 1955.
- Development of the XF8U-1 came from a program that included first use of a flight simulator to determine stability and control characteristics before first flight of the plane. Extensive titanium research was accomplished to make weight savings possible.
- A test and training version of Regulus is equipped with landing gear, permitting the missile to be flown and recovered as many as 15 times.

Minneapolis-Honeywell

Minneapolis-Honeywell reports that its new E-10 autopilot, introducing new concepts in flight control for supersonic speeds, will be installed in the North American F-100D.

The company has a new aeronautical engineering center in Los Angeles to supplement its main facility in Minneapolis. In addition to electronic pilots, the company's new center is interested in:

- The "floated gyroscope," which the company calls the "most accurate aircraft instrument ever designed for use by the Air Force in automatic flight control systems."
- A fuel measuring system that uses transistors instead of vacuum tubes.
- Additional commitments have been made in the field of servo mechanisms, gyroscopes and transistorized stabilization systems for missiles.

Airline Tests HD-31

Air France is testing the prototype Hurel-Dubois HD-31, a possible DC-3 replacement, in the Dakar-Bidjan region of French West Africa. The French carrier placed on order for 20 HD-31s.

WHO'S WHERE

(Continued from page 11)

John W. Mazur is director of Doman Helicopters' new military contracts department, Danbury, Conn.

Frank Glemman has become chief of Civil Aeronautics Administration's control tower at New York's Idlewild International Airport, succeeding **Roger Sullivan**, who moved into the regional office as area operations manager.

Dunstan Graham, former chief of Wright Air Development Center's all-weather section, has been appointed section head of flight control systems at the Grand Rapids (Mich.) Division at Lear, Inc.

Frank L. Smith has been promoted by Trans World Airlines to assistant director of sales promotion.

Joseph L. Hochman has been named plant manager of the Aircraft Products Division of Air Associates, Inc., Teterboro, N. J.

Lester L. Robinson has become assistant chief engineer of Pierce Governor Co.'s Aircraft Accessories Division, Anderson, Ind.

Louis G. Burns has been named sales manager of Niles-Bement-Pond Co.'s Shandler-Evans Division, West Hartford, Conn.

George P. Braender is new U. S. sales manager for Varig Airlines of Brazil.

Philip L. Ward has been promoted by Solar Aircraft Co., San Diego, to sales manager for turbine engines and controls. Other changes: **Eugene H. Ziebold**, manager of industrial bellows sales; **William L. Wilkinson**, field sales manager.

Francis T. Greenup has been appointed chief design engineer of Consolidated Engineering Corp., Pasadena, Calif.

Anthony F. Bernbach has moved up in United Aircraft Corp.'s Hamilton Standard Division, Windsor Locks, Conn., to development engineer in charge of a special propeller program.

Larry Kooi has been appointed material control manager at Pastushin Aviation Corp., Los Angeles.

E. D. Kelley is new director of customer maintenance for Reading Aviation Service, Inc., Reading, Pa. Other promotions: **Hans Hass**, quality control director; **James McKechnie**, supervisor of the Electronics Division.

W. J. Connell has become superintendent of Southwest Airmotive Co.'s Aircraft Overhaul Division, Dallas. He replaces **George H. Kelley**, who has been appointed plant facilities engineer.

William J. Herrmann has joined Avien, Inc., Woodside, N. Y., as military liaison manager.

Kenneth A. Hovington is new manager of sales, contracts and administration for Cossor (Canada), Ltd.

Niels C. Beck has been promoted to assistant manager of program development at Armour Research Foundation of the Illinois Institute of Technology, Chicago. **John T. Kirkland** is new supervisor of the missiles section in the propulsion and structural research department.

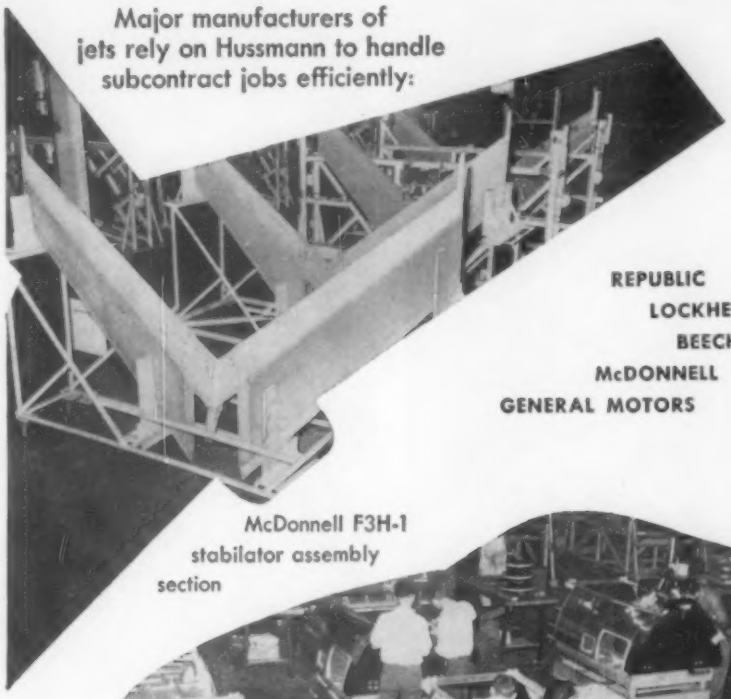
William B. Bement has become production manager for L. B. Smith Aircraft Corp., Miami. Other changes: **C. S. Woodard**, supervisor of material control and planning; **John J. Griffin**, manager of the customer's service department.

JET EXPERIENCED!

HUSSMANN AIRCRAFT DIVISION

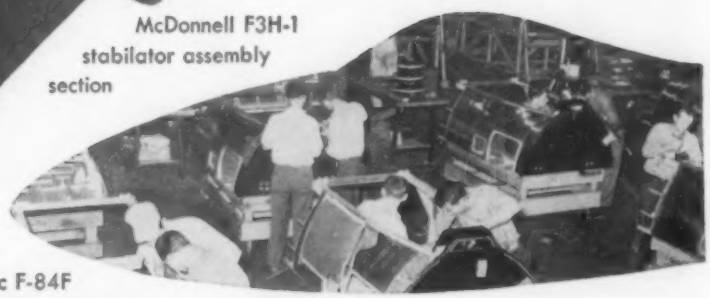
your dependable source of airframe components

Major manufacturers of jets rely on Hussmann to handle subcontract jobs efficiently:



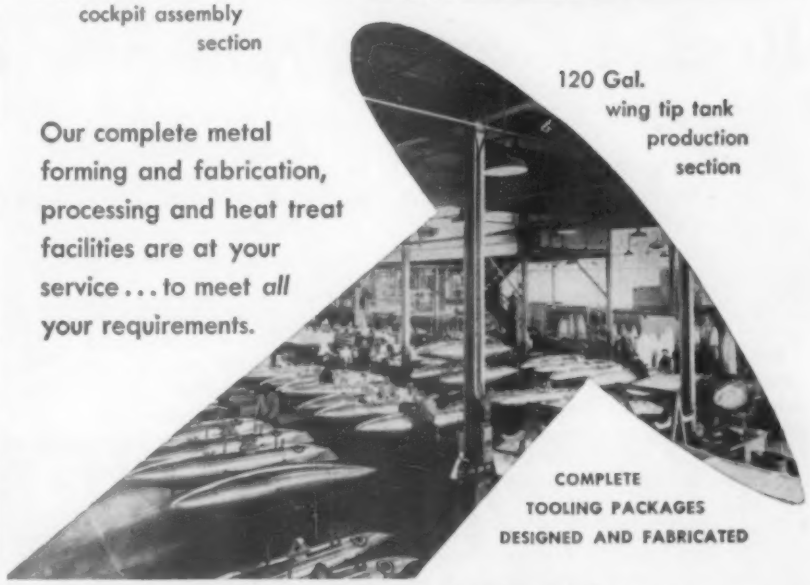
REPUBLIC
LOCKHEED
BEECH
McDONNELL
GENERAL MOTORS

McDonnell F3H-1 stabilator assembly section



Republic F-84F cockpit assembly section

120 Gal. wing tip tank production section



Our complete metal forming and fabrication, processing and heat treat facilities are at your service . . . to meet *all* your requirements.

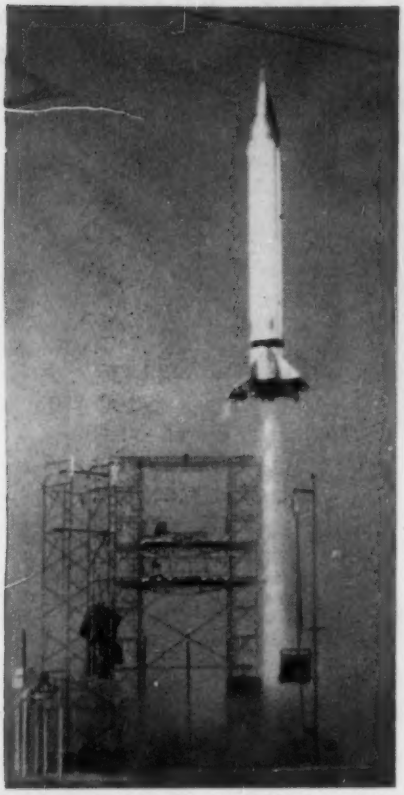
COMPLETE TOOLING PACKAGES DESIGNED AND FABRICATED

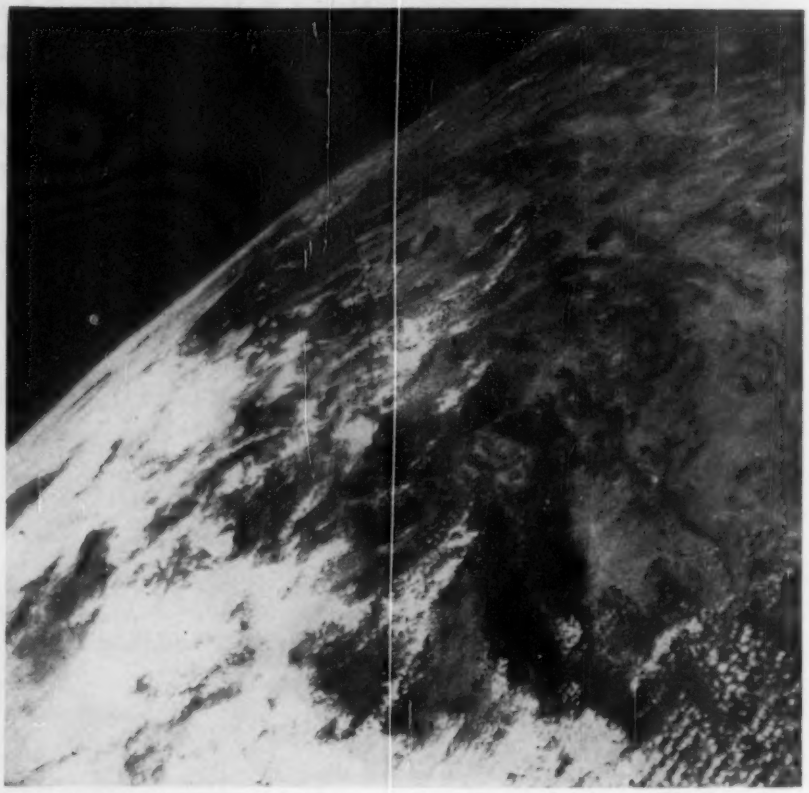
Write for informative brochure today.

HUSSMANN AIRCRAFT DIVISION

of Hussmann Refrigerator Co. · 819 E. Taylor, St. Louis, Mo.

HUSSMANN





RESEARCH ROCKETS, like Martin's Viking, have helped develop new techniques for data gathering at extreme altitudes.

Wanted: A Sponsor, as . . .

Rocket Group Urges Satellite Study

By David A. Anderton

What good is a satellite vehicle?

What unique properties does it have that make it attractive to soldier and scientist?

These are the two basic questions which must form the heart of any satellite program.

They have not been answered adequately yet, in the opinion of many.

But the first formal request for a sponsor for a study of the utility of an unmanned earth satellite only recently was forwarded by the Space Flight Committee of the American Rocket Society to the National Science Foundation.

▶ **Why Do It?**—There's no point in putting up a satellite just for the sake of being able to say so, says the society's committee. Instead, there must be adequate justification for spending the money involved. Even though recent developments in missile technology make it apparent that the satellite program is not the multi-billion effort once feared, it will still cost a sizable amount of money.

The society's report points out the utility of even a modest-sized satellite in six basic fields of science, and has summaries of scientific opinion in those fields to bolster the proposal.

Says the committee: "The study of the utility of an unmanned, earth satellite would be one of the most important steps that could be taken immediately to advance the cause of space flight, and . . . would also increase the country's scientific knowledge and, indirectly, promote its defense."

▶ **No Crew Yet**—A single reason satisfied the society that an unmanned satellite was the only reasonable attack on the subject: Such a satellite is the only type for which feasibility can be shown now.

There is general agreement among the scientists and engineers working in guided missiles, rocket propulsion and upper-atmosphere studies that the unmanned satellite is the best approach. They endorse generally the Space Flight Committee's view that first things come first, and that the unmanned moons come before the piloted ones.

Backing these views are nine years' experience with missile development which has produced the various kinds of rocket engines, airframes and stabilizing systems that might come together in the shining hull of a man-made satellite.

▶ **Useful Here**—Two basic assumptions governed the deliberation of the committee and the scientific opinion they asked for:

- **A small payload could be established in an orbit.**
- **The satellite could communicate with earth stations.**

This frame of reference suggested six different areas of utility:

- **Astronomy and astrophysics,** to overcome some of the limitations placed on observation by the earth's atmosphere.

• **Biology,** to determine the effects of outer-space radiations on living cells.
• **Communication,** to provide a possible transocean link, or to serve as a relay station for transcontinental radio or TV broadcasts.
• **Geodesy,** to determine the constants so necessary (and so approximate right now) to long-range navigation and mapping.
• **Geophysics,** to study radiation effects on the earth's atmosphere and perhaps thus improve long-range weather forecasting.
• **Unusual environments,** to study effects of weightlessness, high vacuum, temperature extremes in a location that could be found nowhere else.

Leading scientists known to members of the committee were asked to comment on the desirability of an unmanned satellite in their kinds of studies. Their detailed considerations of the feasibility of the project form the backbone of the society's proposal.

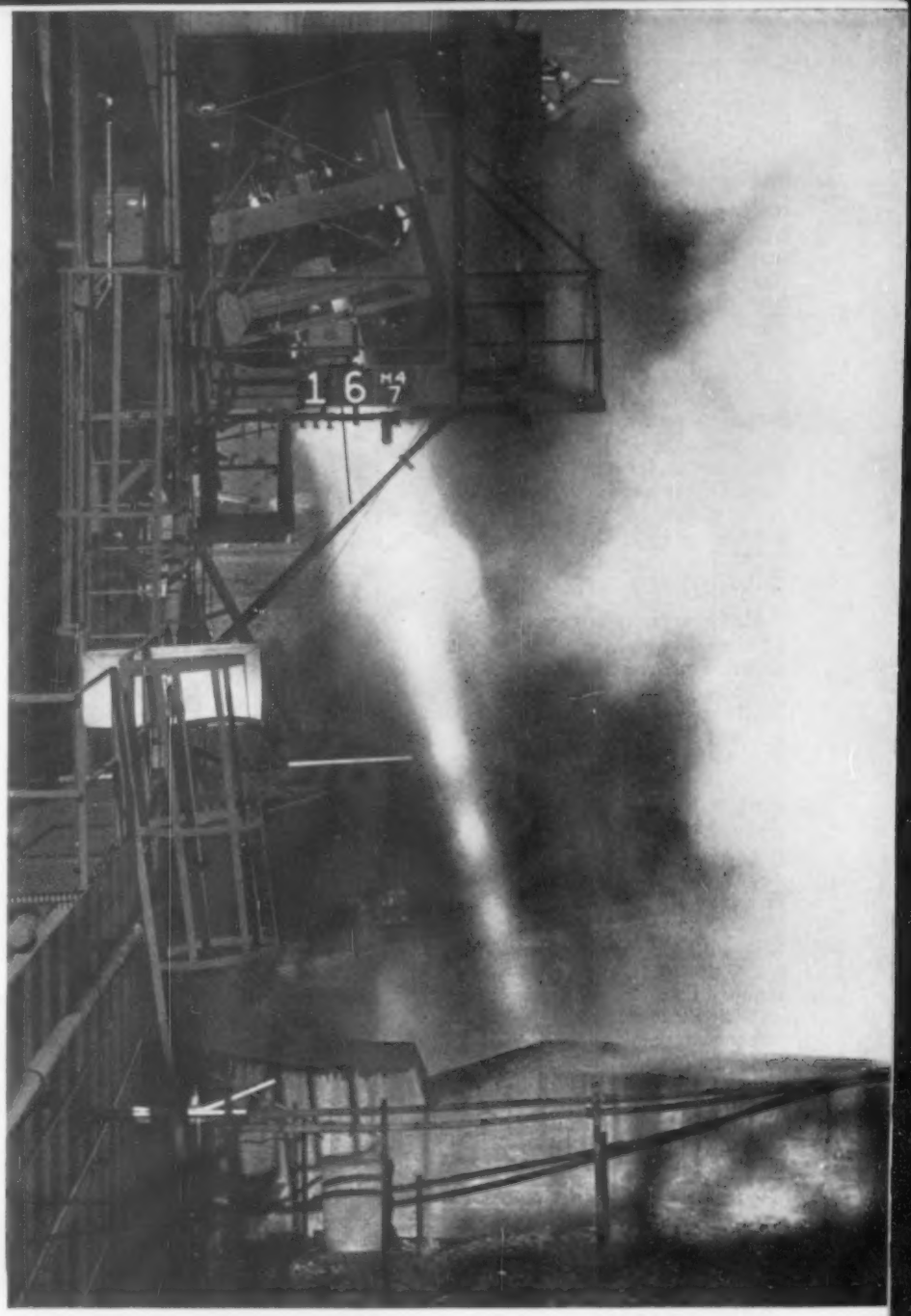
Astronomy

If you could put today's optical equipment outside the atmosphere, you'd get much additional detailed information, says **Dr. Ira S. Bowen,** director of Mount Wilson and Palomar observatories.

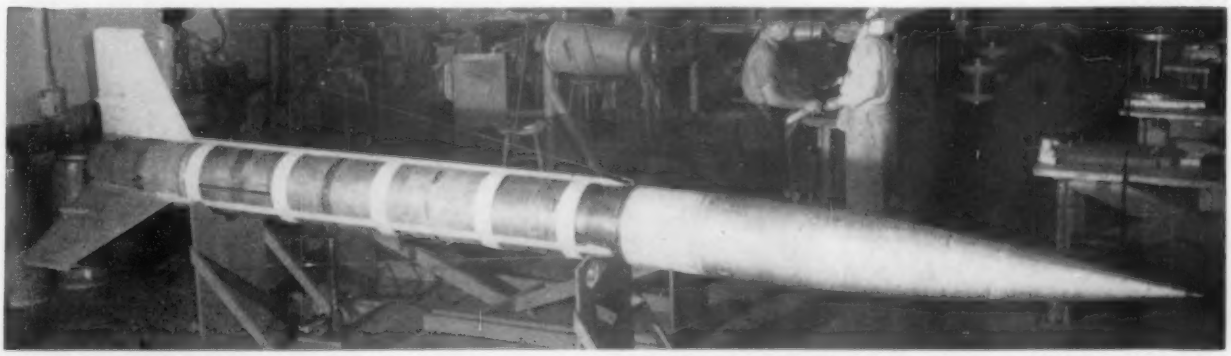
"The ideal situation would be to place the 200-in. telescope (at Palomar) and its accessories on a firm platform such as the moon."

▶ **Unsteady Platform**—But there would be some practical difficulties with the small satellite envisioned, because any optical equipment would be riding on a small and unsteady platform.

Today, from the ground, you can see detail (resolving power, to the astronomer) of objects which subtend about ¼ to ½ second of arc. If you had a 20-in. to 40-in. telescope in space, theory says the resolving power of the lens would be somewhere around 0.25 to 0.125 seconds of arc. This would mean that the satellite itself must have less inaccuracy in its path, and that the orienting and guidance systems would have to be accurate within 0.10



POWERPLANTS have been developed that are only a step removed from the compact, high-thrust units needed for satellite vehicles and eventually for space flight.



AIRFRAME EXPERIENCE has supplied a backlog of structural and materials information for flight at extreme altitudes and speeds.

to 0.01 seconds of arc.

Exposure times from 10 to 24 hr. would be needed to photograph objects of the same faintness as those that can now be photographed from the surface of the earth with the 200-in. scope. With the proposed orbital period of about one hour, there would have to be shielding mechanisms for camera and telescope during the periods the satellite was in the sun.

Not being able to recover photographic plates is another annoyance, Bowen says. But it might be possible to work out a technique in which plates are exposed and developed automatically (as in the Polaroid-Land camera) and then to scan and transmit the fixed image by electronic means.

Biology

Exposure times of many days would be needed to find the effects of primary radiation on animal cells.

There is one hitch, according to Dr. Hermann J. Schaefer, of the U. S. Naval School of Aviation Medicine: You have to recover the animals for autopsy or study.

For this reason, he urges that recovery of the vehicle be considered if there is any thought of studying cosmic-ray effects with it. The great advantages of the satellite over rockets or balloons are, of course, the extended time available and the extreme altitudes. Neither rocket nor balloon can meet both those requirements.

Weightlessness, one of the weird phenomena expected to bother man's mind in future space travel, could be tried out in an animal capsule, not necessarily recoverable, says Schaefer. A few channels of telemetering for blood pressure and respiration should suffice.

But these records will only pass along the physical effects; the mental aspects remain to be studied in some unique manner.

Astrophysics

Energy is fundamental to the study of the atmosphere. The aurora borealis, the ionosphere and fluctuations in the magnetic field depend on energy received from outer space.

The observer on the ground has his difficulties: The energies of most interest to him are absorbed by the atmosphere and he never gets to study them at all. With a satellite, this could be done, in the opinion of Homer E. Newell, Jr. of the Naval Research Laboratory.

Contemporary tests made with rockets have provided the unusual instruments with which we study the solar electromagnetic rediation from visible light down to the X-rays. These

Aviation Week Picture Brief

1. Even coat of sensitizer applied to aluminum to make F-101 rib.

2. Topped by glass-cloth drawing, it gets three-minute light exposure. Then is developed.

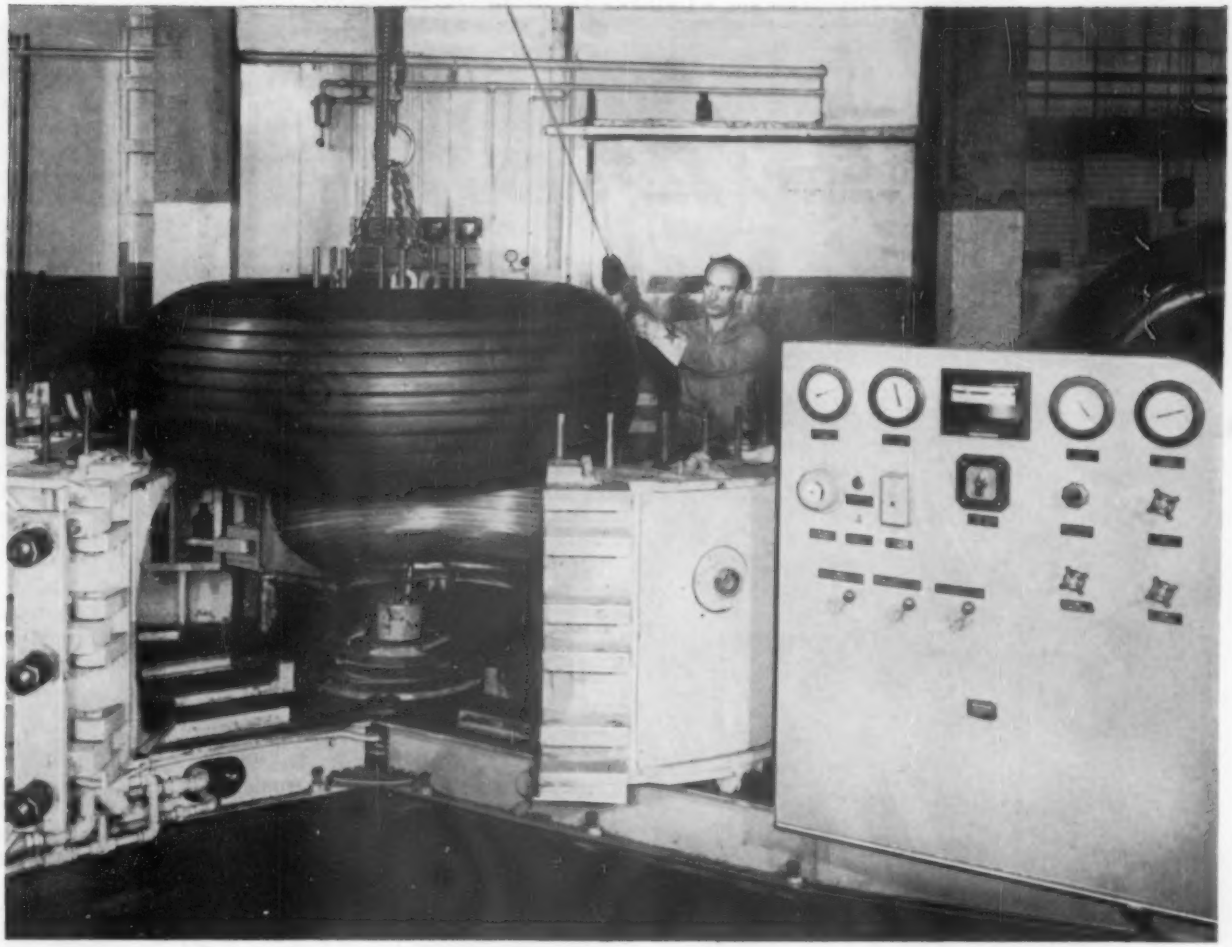
3. Sensitized metal is developed to bring out drawing details. Darkroom is not used.

Handy Kit Aids F-101 Test Staff

Should a part of the F-101 Voodoo jet fighter be damaged or wear out during tests of the plane at Edwards AFB, Calif., McDonnell employes at the base can quickly reproduce one using a "Voodoo-it-yourself" kit developed at the company's St. Louis plant.

The kit was designed when Air Force asked the firm to supply F-101 dimensional blueprints. This would have cost $400,000 for engineering labor alone, McDonnell states, not including valuable time taken off other phases of the project. The kit cabinet contains necessary drawings, reproduction materials and instruction manual. With it, service mechanic can easily find required drawing and reproduce it.

REPRODUCTION KIT contains 1,100 Voodoo drawings and necessary materials for transferring them onto sheet metal. It was designed for use at all F-101 bases.



THOMPSON TECHNIQUE
builds superior treads

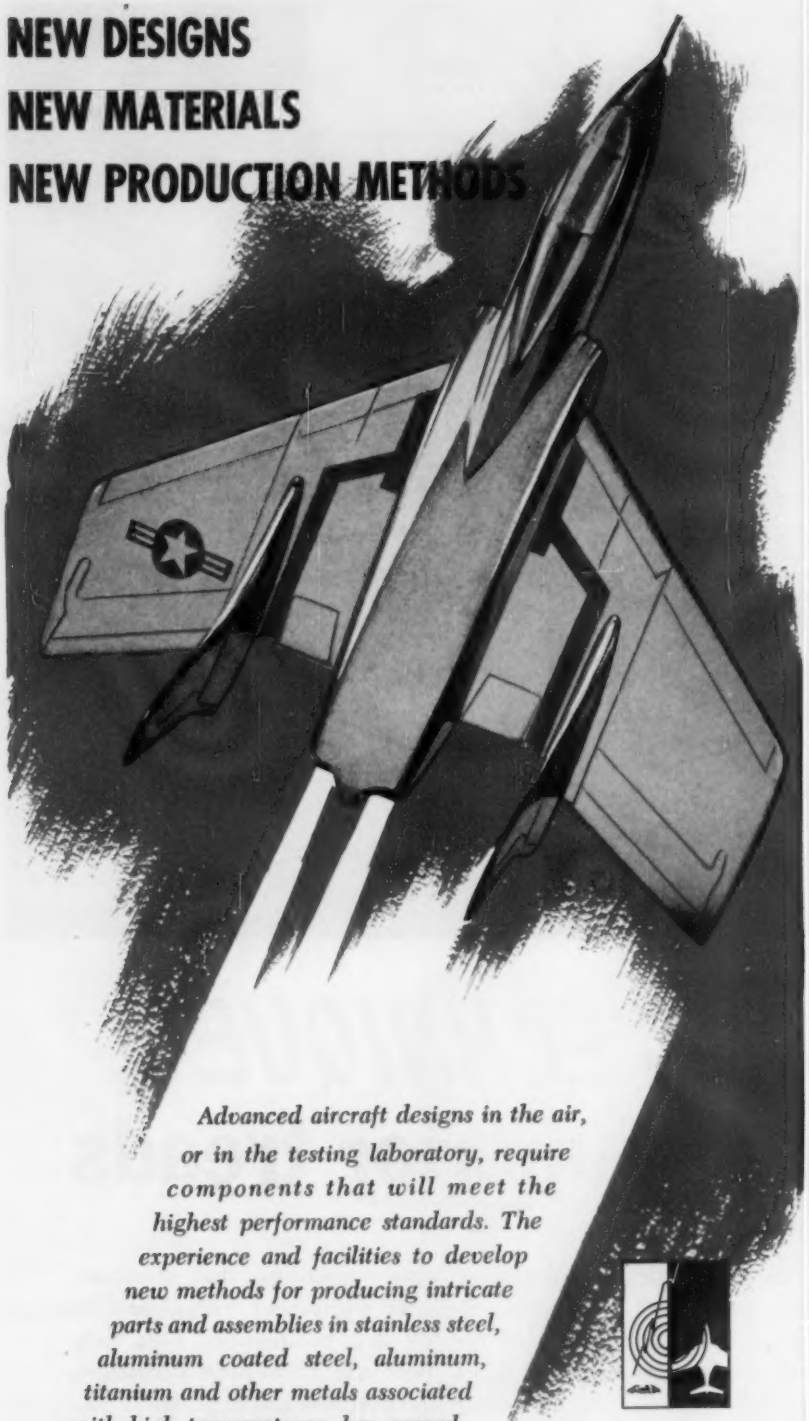
Retreading equipment alone cannot build quality retreads. Others can have retreading equipment but only Thompson has the world's largest and most modern facilities plus years of experience retreading tires of every make and size. Through this experience, Thompson has developed an exclusive technique in quality retreading that combines properly designed equipment with close controls of quality and production. This technique is, in effect, the *Thompson Technique* . . . a personal expertness and experience that builds into every Thompson retread or top-cap unequalled safety and long life.

Write, wire or phone the Thompson plant nearest you

THOMPSON *Aircraft Tire* CORPORATION

WESTERN PLANT: 18th and Minnesota Streets, San Francisco 7, California · Mission 7-7320
EASTERN PLANT: International Airport, Miami 48, Florida · Phone 88-1681

NEW DESIGNS
NEW MATERIALS
NEW PRODUCTION METHODS



Advanced aircraft designs in the air, or in the testing laboratory, require components that will meet the highest performance standards. The experience and facilities to develop new methods for producing intricate parts and assemblies in stainless steel, aluminum coated steel, aluminum, titanium and other metals associated with high temperatures, has earned for Lavelle the reputation for being foremost in precision fabrication for the aviation industry.

A new brochure describes Lavelle's specialized fabricating services. Write for a copy without obligation.

Lavelle

LAVELLE AIRCRAFT CORPORATION · NEWTOWN, BUCKS COUNTY, PA.

techniques could be adaptable to use on a satellite.

► **Tough Problems** – There are problems. Take power requirements, for example. Making measurements requires some form of energy, probably batteries. Weight and space limitations would hold a satellite to short-time operations, because not enough batteries could be carried aloft. Instead, periodic operation could be used, or low-current transistors in the instrumentation to lower the load. Sunlight could be used to recharge the satellite's batteries.

Temperature is another tough problem. If the satellite keeps one side toward the sun, that will soon grow intolerably hot. If it rotates, there has to be orientation built into the sensing devices for every instrument it carries.

Weightlessness in the satellite is another cause for concern. Bubbles of gas in the batteries, which would normally pass off on earth, would stay where they were formed and cause the electrolyte to fizz.

The structure of the satellite would be giving off gases continuously from all surfaces exposed to space, and the metal would slowly evaporate in the near-vacuum. These effects would make it almost impossible to measure the contents of space near the satellite, says Newell.

Meteorology

Solar radiation phenomena have to be studied in detail, because they are the triggering action for the dynamics of the earth's atmosphere. A space platform would be ideally suited for collecting solar measurements, says Eugene Bollay, of North American Weather Consultants.

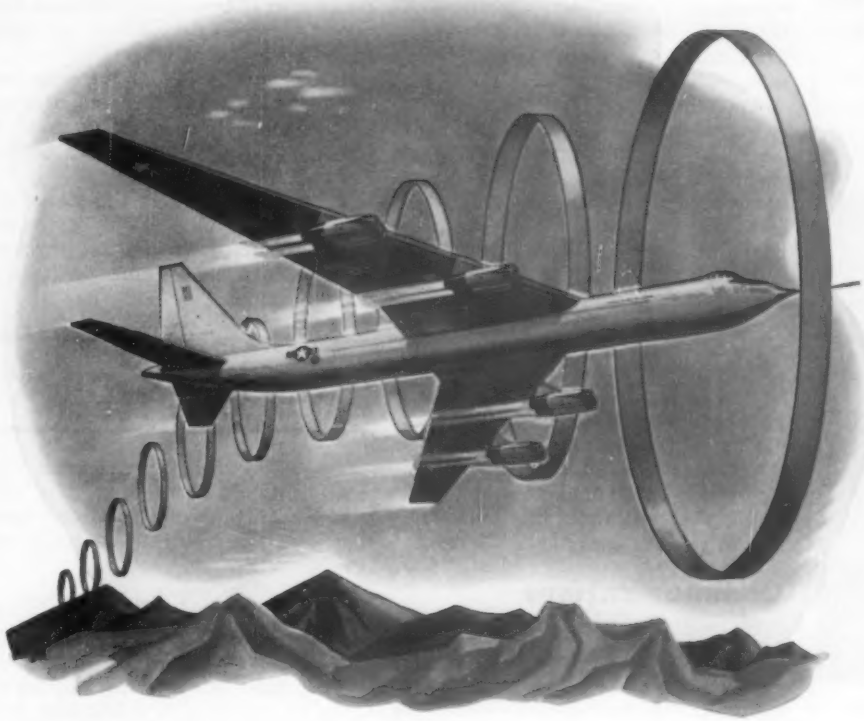
A census of meteoric dust, recently correlated with annual rainfall by Australian scientist Dr. Bowen, deserves intense research, he adds.

Geodesy

With special techniques, the satellite could be observed with visual aids at 250 miles high; at 1,000 miles, there would be trouble seeing it.

The difficulty in applying such a celestial object to geodesy, says John O'Keefe, of the Army Map Service, is that we don't have adequate geodetic data to predict an accurate orbit.

He says that an object at 500 miles might be measured by European and American stations with a discrepancy of one minute of arc, because of the inconsistencies of latitude and longitude values in Europe and over here. Or there might be a discrepancy of about 10 sec. per revolution between positions calculated from observations,



73 American Welded parts

IN EVERY J-57 JET ENGINE

For 35 years American Welding know-how has kept pace with the aviation progress. Today a large part of our extensive welding, machining and fabricating facilities are devoted to the production of welded components for U. S. jet engine manufacturers — 73 different kinds of parts on the Pratt & Whitney Aircraft J-57 turbojet alone.

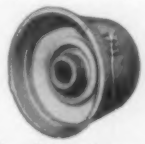
This knowledge of welding and fabricating has also been applied to other industries. For example, if you produce a component like those shown here — or if you think fabrication by welding may be the solution to a particular problem —let us know. Our Product Development Division has been able to assist many companies with their metal fabricating problems and will be glad to consult with you.

THE AMERICAN WELDING & MANUFACTURING CO.
420 DIETZ ROAD • WARREN, OHIO

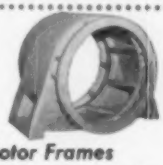
AMERICAN WELDING

WELDING • MACHINING • FABRICATING

Tire Bases
Steel bands formed and flash butt-welded into wheel tire base for industrial trucks.



Wheel and Rim Assemblies
Weldment of carbon steel bar and plate for use on heavy earth-moving equipment.

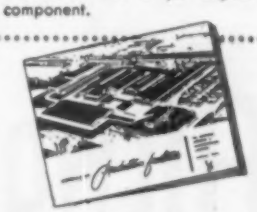


Motor Frames
Steel bars and plate formed and welded into industrial motor frame.

Compressor Cases
Welded band for hermetically sealed refrigerator compressor.

Armature Spiders
Weldment of six parts combining plate and bar stock.

Turbine Frame Assemblies
Formed sheet metal bands and flash butt-welded rings fabricated into a jet engine component.



Send for Free Catalog of American Welding Facilities

"Risk appraisal is our business—

With over a billion dollars of insurance in force, we are well aware of the risk factor in all forms of transportation. That's why we use our own company plane to transport our executives. It is a Twin Beech—powered by dependable Airwork overhauled P & WA engines.

Robert M. Stone,
Chief Pilot
Life & Casualty Insurance Company of Tennessee.

BRANCHES IN—
ARLINGTON, ATLANTA, MIAMI, NEWARK.

Airwork
CORPORATION
Millville, New Jersey

and the actual position. For a two-hour orbit, this amounts to an error of two minutes of arc per day.

► **Study of G**—The relative positions of continents could better be determined if a satellite were used for coordinated triangulation, according to O'Keefe. The absolute value of the acceleration of gravity could be obtained from observations from a single country, and would represent an average value over a considerable area. Currently, the technique is to measure G at many points and then average them; there is danger of under-representing the mountainous areas, so that systematic errors are created.

Right now, the earth's rotational speed can not be stated with accuracy. The reason: lack of exact knowledge of the earth's semi-major axis. Working backwards from the earth's surface linear velocity as measured by observations using the satellite, it should be possible to calculate the semi-major axis length to the accuracy desired.

Communications

Satellite radio relays seem attractive only for spanning oceans, according to Dr. John R. Pierce. They lack the flexibility of overland systems, and there is not much reason to hope that satellite relays could compete with microwave radio relays or coaxial cables in cost.

There are two different systems that seem reasonable:

- **A number of spheres** in relatively near orbits, so that one of them can always be "seen" by transmitter and receiver.
- **Use of a plane mirror** with a 24-hr. orbit above the equator at an altitude of 22,000 miles. It would be visible to within nine degrees of the Poles, or in other words, to all inhabited latitudes.

Satellite Design

There is striking dissimilarity in the satellite designs envisioned in the opinions above.

They vary from Pierce's 100-ft. plane mirror at 22,000 mi. to an 8-ft. hollow aluminum sphere (O'Keefe) to the "rather small vehicle" of Schaefer. Time in the orbit varies from a few weeks at the most (Schaefer) to the indefinite period assumed by Pierce.

Perhaps this is one of the biggest arguments for a coordinated study of the satellite issue. It is obvious and reasonable that each scientist envisions the satellite in a form most useful to his particular field of knowledge.

Thus, O'Keefe's hollow sphere might also serve as Pierce's reflector, but certainly not as Bowen's telescope platform.

The biggest task facing any satellite-study team will be a proposed final design. It's going to have to be the trickiest of compromises: the kind that satisfies everybody without satisfying anybody completely.

It is not a matter of the next two years. It is not a multi-staged man-carrying interplanetary rocket ship. It is not in blueprint form. It is not being built now, anywhere.

It will come out of this proposal—a dead-serious proposal for a realistic study of one of the greatest engineering challenges of all time: earth's first artificial moon.

THRUST & DRAG

Is it too late for Christmas card sentiments? Then share this one, which came to us on a handsome greeting from our British contemporary, Flight:

". . . Our hopes,
Like towering falcons, aim
At objects in an airy height;
The little pleasure of the game
Is from afar to view the flight."
—Matthew Prior

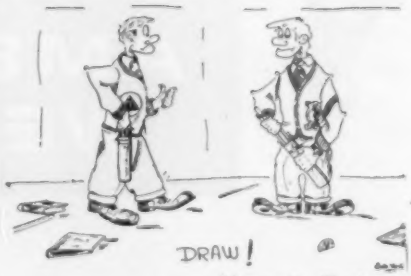
* * *

The Association to Sell Topsy—Who Just Growed—Down the River met recently and urged that consideration be given to barring the barriers.

"We believe," said their statement in part, "that barriers have no real place in aviation. We have lived to see the 'power barrier' of the '20s overcome by decent engines; we have seen the 'sonic barrier' of the '30s proven to be a piece of fiction. But now we face a 'thermal barrier,' a 'yaw barrier' and a 'runway barrier,' to name only three.

"Therefore this Society resolves to create a new barrier, to be called the 'barrier barrier.' In the strictest sense of these words, then, we will resist any and all attempts to place fictitious barriers in the way of our pilots and engineers, who have enough to worry about anyway."

—DAA



Marquette Engineer

The Learstar is a dramatically new kind of executive airplane. Its exceptional speed and range can be matched by only the latest four-engine commercial airliners. And—like these super-airliners—the Learstar is certificated in CAA's highest operational category—CAR, part 4b.

Learstar

MODIFICATION OF FAMOUS LOCKHEED LODESTAR

WORLD'S FASTEST EXECUTIVE AIRLINER

LEAR INC. AIRCRAFT ENGINEERING DIVISION, SANTA MONICA, CALIFORNIA

LS-3

Tape Will Run Convair Milling Machine

Air Materiel Command is sponsor of new project designed to slash the number of steps required in setting up and controlling cutting.

By Irving Stone

San Diego—An ingenious concept for translating engineering data into a finished part through numerical intelligence fed directly to a milling machine has been formulated by production engineers at Convair Division of General Dynamics Corp.

This scheme to translate information electronically into metal shapes has these targets:

- **Afford a closer approach** to product design requirements.
- **Eliminate time-consuming steps,** error, and considerable tooling involved in the conventional method of creating a difficult machined part from engineering drawings.
- **Achieve production articles** which have configuration and dimensions identical to those of an accepted prototype.

▶ **AMC Contract**—To carry out this production concept, Convair was awarded a prime contract earlier this month by USAF's Air Materiel Command. The unique contour milling machine and its director (electronic intelligence capability) envisioned by the plan is scheduled for installation in the Air Force facility Plant 2 at Convair-San Diego.

The project doesn't put Convair into the machine tool business—the company will subcontract all of the machine and electronic components. It probably will be at least 18 months before the overall system is installed and ready for shakedown runs.

Cost of the equipment is figured at $1,128,000, including development of the programming phase. Initially, the project will require that 8-12 technicians be specially trained to set up planning forms, standards and other operational details.

Personnel associated with Massachusetts Institute of Technology's numerically controlled milling machine experimental development have collaborated closely with Convair's production tool engineering team to formulate the specifications for the new milling system and transmit to these engineers fundamentals of system operation.

▶ **Short Cuts Seen**—Slashing the number of steps now involved in setting up for and controlling the cutting operation is one of the big experimental aims of the projected tape-directed milling installation.

Conventional method of tooling, Convair engineers point out, requires a layout on a tool design board, calculation of angles and contours, layout on steel by the tool manufacturing shop, machining of tools from either the dimensions furnished or laid out, and checking the tools against the master gage. Tools are then turned over to the production shop for the holding and control of the production part.

With the new system, it will be possible to program the engineering dimensions into a standard form. The data on the form will be punched into a machine which will transcribe the information onto a tape. This will be fed into a computer which will transfer the data onto a magnetic tape. This tape, in turn, will be fed into the machine's console for control of the miller's motion.

Thus, where a tool planner, designer and maker and a machine operator are now used, these talents will be combined into one in the form of a tool program engineer. He will interpret the engineering design into the machine setups, feeds and speeds for the standard form—reducing it to the numerical code.

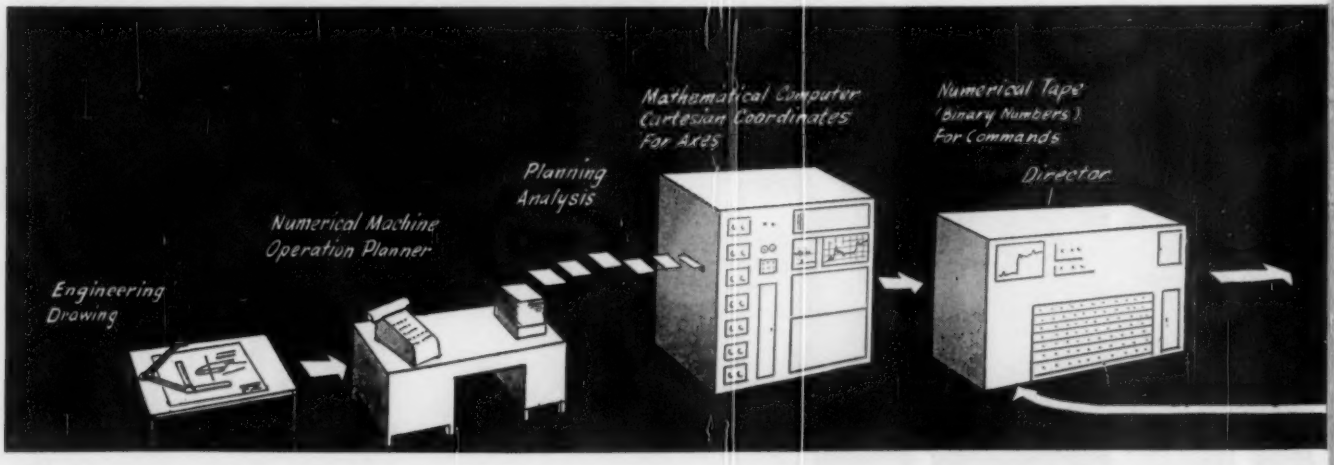
▶ **Emergency Benefits**—This new approach should save a substantial amount of tooling dollars and pare considerable lead time.

For example: In a state of all-out mobilization, if there were production versions of the machine and its associated intelligence system in the shops of the various subcontractors, the prime contractor would have to send them only the magnetic intelligence tape by air courier.

Theoretically, the subs could be in production the next day, eliminating elaborate subtooling that is normally required and the months of time this would consume.

Thus, where two to three months might be spent building a family of tools for each subcontractor, it would only be necessary now to create a new magnetic tape to prepare the subcontractor for production.

These are the steps in setting up the tape-controlled



▶**Built-In Control, Changes**—Another big advantage seen for the system is the elimination of many, perhaps all, inspection points. Theoretically, built-in (controlled) quality control would be provided by the projected Convair setup.

Transition from prototype to production part will involve no problems. The machine will make the prototype according to the engineering design information fed into the system. If the prototype should fail in testing, the tape can be erased in the area required and new information fed in—a new part formulated, either adding metal or taking it away, as required.

The tooling would not have to be changed to make the revised part.

In this way, the production part is immediately available from a stored tape, when it is required for production runs.

▶**Miller's Capability**—The milling machine contemplated in the Convair installation should cut any configuration required for aircraft structure. In addition to this type of service, the cutting machine should fill a big bill in die-sinking work.

Because of the inherent rigidity of the machine and its variable speeds and feeds, it will be capable of milling steels, titanium alloys and aluminum alloys.

The miller will be the only one of its kind with respect to the large number of selective operations it will be able to do. Now, instead of the 5-axis machine there has been talk of developing, a Convair spokesman says, the new concept should result in a machine which will embody as many as 18 axes of operation with the rotary table, cutting heads and cutting tools in selective positions. This would be done by storing information on the magnetic tape for selection of operational axes as required.

For any single head, it will be possible simultaneously to move the bed, the turntable, the head, change depth and angle of cut. This will apply to any of the four heads (two horizontal, two vertical) the machine will have.

It will be possible to use two heads—the two horizontal or the two vertical units—together, so that two identical parts could be cut by the miller at the same time.

▶**Automatic Job**—In operation, the tape information would be relayed to a head so that it would cut its part of the job, automatically return to its homing position, with another head automatically taking over for its cutting job. Also, the bed and turntable could be engaged and stopped, with the push of a button.

Bed clearance will be 10 ft. wide by 20 ft. long—a size considered most feasible, by Convair engineers, for the average aircraft part in the foreseeable future. The miller probably will have a variable table speed of about 1 to 100 in.

Production versions of the miller itself, if they are built, will not necessarily have the four-head versatility of the prototype planned by Convair, because it is felt this innovation will not be necessary.

The new machine is planned mainly to prove the concept of programming and selectivity of operation.

WHAT ELECTRONICALLY CONTROLLED MILLING COULD MEAN

1. **Tool program engineer combines functions of tool planner, tool designer, tool maker and machine operator.**
2. **Tape could be shipped to subcontractors and permit them to set up and be in operation in a day.**
3. **Built-in quality control could eliminate many inspection points.**
4. **Transition from prototype to production parts is simple.**

Defense Plants to Get New Security System

Defense Department has taken steps to speed security clearances for defense plant workers and to make sure there are fewer needless suspensions.

Effective in the near future, the problem will be handled by a new Pentagon office, headed by a director to be appointed by Defense Secretary Charles E. Wilson. Screening of industrial workers who must be cleared for access to classified information will be performed by a central office.

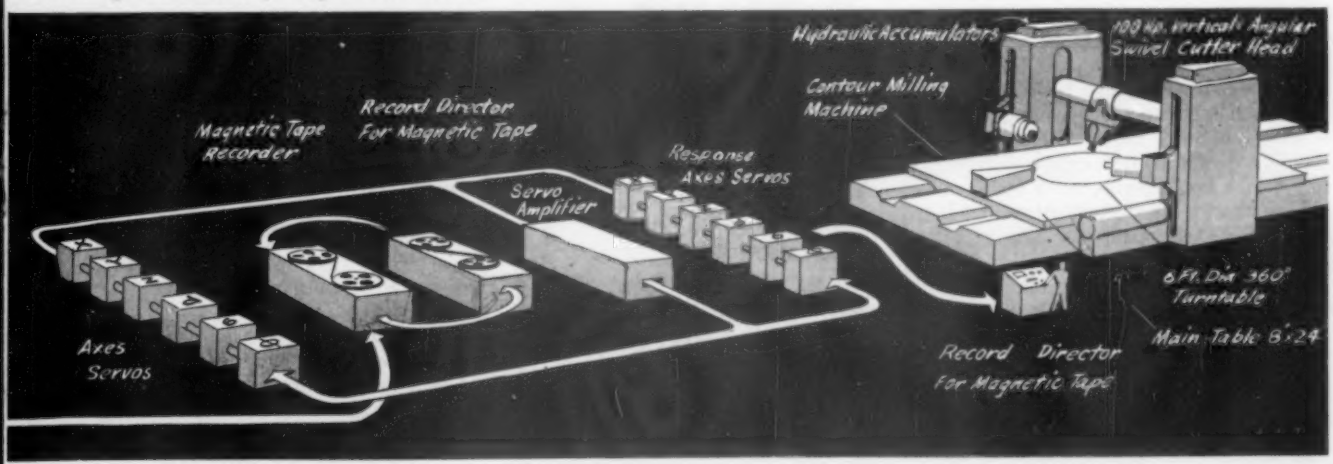
The change in the system covering more than 2-million defense workers followed reports that the Justice Department has decided persons accused of being security risks should be allowed to face their accusers.

Material Review

Research and development progress in the field of improved transparent materials for aircraft was reviewed last week in Dayton at a meeting sponsored by Wright Air Development Center and the Aircraft Industries Assn.

Representatives of the aircraft industry, military services, fabricators, vendors and foreign countries attended.

milling machine for production



Weight-Saving Titanium Bolts Available in Production Quantities

New titanium alloy bolts, which the manufacturer claims can be substituted part-for-part for comparable high-strength steel units in aircraft structures at weight savings of about 57%, are on the market in production quantities.

Pound for pound the new item can take a maximum dynamic load more than twice that of comparable steel bolts "without ever failing through fatigue," according to the producer, Standard Pressed Steel Co., Jenkintown, Pa. The fastener is trade-named Hi-Ti.

The first units were only ¼-inch-diameter, 2¾-inch-long internal wrenching bolts.

The firm states that it is now producing other types and sizes of titanium alloy fasteners. Production items have been shipped to the Aircraft Production Resources Agency, Wright-Patterson AFB, Navy BuAer and to 18 leading airframe and engine manufacturers in the U. S. and in Canada.

▶ **Weight Savings**—The ¼-inch titanium units cost about 60 times more than equivalent steel bolts (just under $100/lb. vs. $1.50/lb.).

There is no doubt that titanium fasteners save costly airframe weight, which, as SPS points out, some authorities peg as worth $200 per pound or more. One airframe builder estimates that titanium fasteners would save approximately 50 lb. if used on its supersonic single-engine fighter.

Weight savings of up to 2,000 lb. may be accomplished by wholesale substitution of titanium fasteners for their steel equivalents, according to James Duke, product planning manager, Elastic Stop Nut Corp. of America (AW Jan. 10, p. 37).

▶ **High Strength**—The Hi-Ti is fabricated from a titanium alloy containing 4% aluminum and 4% manganese. Initial Hi-Ti's are designed to directly replace present Military Standard 20004 series bolts-high-strength fasteners used in critical points.

Each of the initial shipments of Hi-Ti's carried a test report detailing the ¼-inch bolt's performance and comparing it with its steel counterpart. In the MS-20004 series, the SPS report shows:

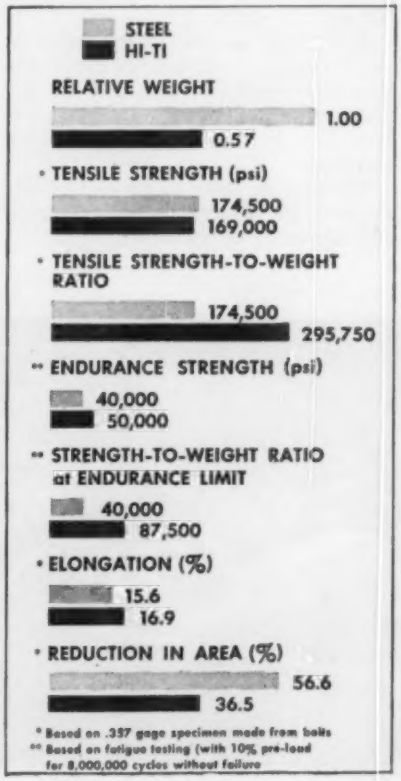
• **On the basis of tensile strength,** disregarding fatigue, the Hi-Ti lags slightly behind the steel bolt. Test specimens machined from Hi-Ti's had a tensile strength of 169,000 psi. Specimens from steel bolts showed 174,500 psi. But on the basis of weight comparison, the titanium alloy item showed a tensile strength-to-weight ratio 70% greater than that of the steel bolt.

• **Under fatigue conditions,** the Hi-Ti proves superior to the steel bolt even when weight is not considered. Endurance is determined arbitrarily by stressing the bolt for eight million cycles. Complete fatigue data on both types of fasteners, presented by Standard Pressed Steel in the form of S-N (stress vs. number of cycles) curves, show that the ¼-inch Hi-Ti's endurance strength is approximately 50,000 psi.—25% higher than that of the steel item.

Titanium Theory

Standard Pressed Steel has this theory about the notch sensitivity of titanium, developed during the 30-month Hi-Ti crash research program:

The firm believes that the problem traces to the metal's ductility. It notes that titanium has a modulus of elasticity half that of steel, and, as a result, stretches twice as much under a given load. The additional stretching tends to widen surface cracks more rapidly and hence weaken the metal.



• **Under a 77,000-psi. load**—a specific test condition under military specs—the Hi-Ti bolt lasted for an average of over 100,000 cycles before failure; the steel bolts an average of 85,000 cycles.

▶ **Trials and Tribulations**—Standard Pressed Steel's titanium alloy bolt problems began in the quality control department, where, SPS engineers relate, "incoming shipments . . . varied almost incredibly in quality."

These were some of the problems the firm's technicians had to work out:

• Titanium's notch sensitivity extending to the very surface finish of the material posed a serious barrier, since the threads of a bolt, as well as the junction, of head and shank presented natural "notches" that could not be eliminated. Some of the answers: Refinement and improvement in threading technique and design and equipment; producing a surface finish smoother than eight micro-inches (compared with about 30 micro-inches for steel bolts), redesign of the fillet area under the head and considerable tightening up of working tolerances.

• Fabricating headaches included the bolts shattering when cold forging was tried; when hot-forging by steel-making techniques was tried, the bolts turned out worthless. SPS apparently salvaged some lessons from the latter process, however, and discovered that it could be employed within a critical temperature range and with special tooling, special heating equipment and advanced forging techniques.

Even so, the process has to be closely controlled to keep the flowing metal from developing localized hot spots, the firm states. Internal heat from the forging process was found to produce troublesome grain coarsening and resultant loss in fatigue strength.

$10-Million Bendix Expansion Under Way

A $10-million expansion of engineering facilities of Bendix Aviation Corp. is under way, President Malcolm P. Ferguson told the company's stockholders at the annual meeting in South Bend, Ind.

The 1954 sales volume exceeded $600 million and expenditures for engineering were more than $81 million, Ferguson said. He explained that the accelerating pace of engineering development, particularly in the electronic field, has required enlarged facilities at a number of the corporation's divisions.

▶ **Expansion Plans**—He cited new headquarters for the corporation's Research Division to be constructed in the Detroit area, and additions to existing facilities in California, Indiana, New York, New Jersey and Maryland.

GOVERNMENT PRODUCTS DIVISION

Responsibility...a sacred trust at Rheem.

You can rely on Rheem to fulfill every commitment with complete responsibility, whether it involves long-range research, precision engineering or quality-controlled production.

This intrinsic sense of responsibility has been a forceful factor in Rheem's enviable record of low-cost per unit production and on-time completion schedules.

Rheem's integrated Government Products Division facilities are presently in quality production on prime contracts for the United States Government and sub-contracts for other industry leaders.

YOU CAN RELY ON RHEEM

RHEEM Manufacturing Company...Government Products Division
Downey, Calif. • San Pablo, Calif. • Washington, D.C. • Philadelphia, Pa. • Burlington, N.J.

PRODUCTION BRIEFING

▶ **Ryan Aeronautical Corp.,** San Diego, Calif., will build large numbers of F-86 aft fuselage sections for North American Aviation, Inc., under a multi-million dollar contract. Transfer of necessary tools from NAA to Ryan has begun and first fuselage units are to be delivered beginning in June. . . . Ryan has received its second major subcontract for Boeing KC-135 jet tanker-transport assemblies. It covers production of the KC-135 fuselage mid-section in addition to the aft section, for which Ryan received a contract previously. The two sections total a 60-ft. portion of the plane.

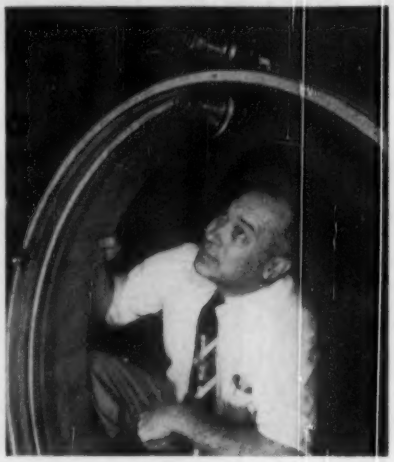
▶ **Cook Electric Co.,** Chicago, Ill., has opened a West Coast office at 302-B S. Brand Blvd., Glendale, Calif. Manager is Joseph B. Wilson.

▶ **Template Reproduction & Engineering Co.,** is new name for consolidated operations of MLA Engineering Co., Inc. and Template Reproduction & Engineering Co., both of Philadelphia, Pa.

▶ **A. R. Tiburzi & Associates** is a new firm of aviation consultants and sales representatives, located at 527 Lexington Ave., New York, N. Y.

▶ **Doric Co.,** aircraft tooling firm, has moved into new 24,000-sq.-ft. plant at Avalon Center and Rosecrans Ave., Los Angeles, Calif. The company is drawing plans for an additional 60,000-ft. of facility.

▶ **Beading** of titanium cylindrical shells has been developed by F. N. LaMartine, Chance Vought, Inc., Dallas, Tex., tooling research engineer. Using an adapted Niagara machine, metal to be



beaded is fed between adjustable tension rotating draw rings. Both external and internal beads have been made on 0.012 stainless steel and 0.012 RC-70 titanium. Other forms such as elliptical, kidney or irregular shaped may also be applicable to the process, on which a patent has been applied for. LaMartine came up with the cold-forming method to answer a need for stiffer and lighter shroud wrapper around jet engine hot afterburner sections.

▶ **Thompson Products, Inc.,** expects to build a $5 million engineering study center just east of its Euclid Ave., Euclid, Ohio, plant, to facilitate development of new processes, products and materials. Ground is to be broken for initial two units this fall.

▶ **Reinforced plastics industry** comprises about 150 firms in the U. S., the Society of the Plastics Industry, Inc. reports, with half of these located in West. More than 50 California reinforced plastics firms produce items valued at over $100 million annually, SPI notes. More than 27 million pounds of polyester resin and over 10 million pounds of fibrous glass were used by the industry last year. In the next five years resin use alone may exceed 100 million pounds, the Society states.

▶ **Huck Manufacturing Co.,** Detroit, Mich., has acquired an additional building of 46,000 sq. ft. to house expanded production and research equipment. This expansion was inadvertently described in this column as comprising 14,000 sq. ft. (Jan. 24, p. 41). Aviation Week regrets the error.

▶ **Employe suggestions** at Republic Aviation Corp., Farmingdale, L. I., N. Y., have saved the firm an estimated $1.25 million, some $250,000 of this in 1954. Accepted ideas earned employees $27,000 last year.

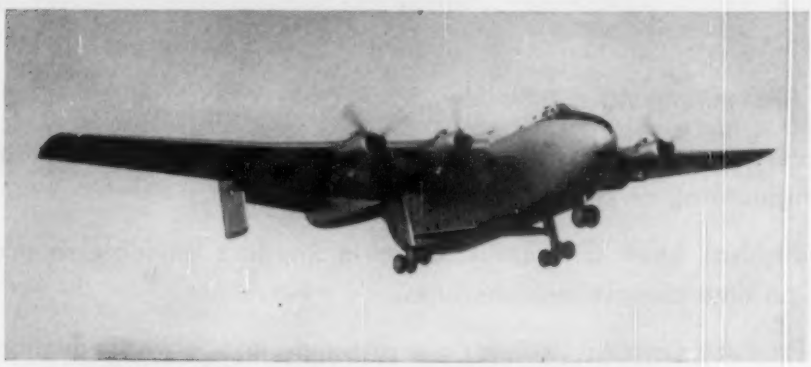
▶ **Consolidated Western Steel Division,** United States Steel, Los Angeles, Calif., is fabricating three supersonic and hypersonic wind tunnels for use at USAF Arnold Engineering Development Center, Tullahoma, Tenn. Firm is also fabricating and/or installing some 3,000 tons of ducting, travelling cranes, valves, buildings and electrical and mechanical equipment for the Center's Gas Dynamics Facility. In addition, CWS is handling 2,500 tons of similar items for the Ram Jet Addition to the Engine Test Facility there.

▶ **Weba, Inc.,** New Hyde Park, L. I., N. Y., maker of aircraft hydraulic, pneumatic and mechanical components, has appointed S. J. Alexander as sales representative for Ohio, Indiana, Michigan, Illinois and Missouri; W. J. Henley will handle Alabama, Florida, Georgia, North and South Carolina and Tennessee and Joseph Reddy the New York-New Jersey area. New chief engineer for Weba is George Bales, formerly with Hydra-Power Corp.

▶ **Utica Division,** Bendix Aviation Corp., has opened a new $100,000 facility in North Hollywood, Calif., to service and test fuel-air combustion and air turbine starters for military and civil planes built in this area.

▶ **American Products Co.,** Staten Island, N. Y., has purchased assets of Roger Alan Mfg. Co. and will concentrate on design, development and production of precision machine parts for electronics and aircraft.

▶ **Winder Aircraft Corp.,** Winder, Ga., has opened a Washington, D. C., office in Suite 6080W, 4201 Massachusetts Ave., N.W. George R. Kitt will be the firm's representative in this city.



British Fly 60-ton Production Beverley

First production Blackburn Beverley transport for Britain's Royal Air Force is shown aloft on its first flight. The plane is powered by four 2,850-hp. Bristol Centaurus piston engines and can carry a 22-ton payload. Takeoff run at full load is 790 yd; landing run, similarly loaded, is 310 yd. Fuselage cargo compartment measures 40 ft. × 10 ft. × 10 ft. The tailboom is larger than a Douglas DC-3 and can seat 36 troops.

HIGH PERFORMANCE
PRESSURE SWITCHES

These recently developed aircraft pressure switches cover operating points within the entire range of inches of water through 3000 psi. Construction materials are compatible with operating media encountered in current and foreseeable aircraft applications. Design features permit all switches to meet or to exceed the requirements of MIL-E-5272A and other applicable performance specifications. The three illustrated here are widely adaptable for specific applications — demonstrate the high performance standards of our complete line.

Our long experience and extensive facilities for developing, manufacturing and testing pressure switches for modern aircraft can be helpful to you. Engineering counsel is at your service. Please direct your inquiry to our headquarters plant, Danbury, Connecticut.

Differential Pressure Switch, Type 6840

DIFFERENTIAL ADJUSTMENT RANGE: 10 to 50 inches of water. **RESET VALUE:** 1.5 inches of water. **EXTERNAL ADJUSTMENT:** Doubly locked. **TEMPERATURE RANGE:** Minus 65° F. to plus 165° F. **WORKING PRESSURE:** 5 psig maximum. **PROOF PRESSURE:** 10 psig without setpoint drift. **VIBRATION:** Models available capable of meeting MIL-E-5272A Procedure I. **OVER-ALL DIMENSIONS:** Height 4-3/16", Width 6⅛", Length 6⅛". **WEIGHT:** 1 lb. 10 ozs.

Pressure Actuated Switch, Type 6885

PRESSURE ADJUSTMENT RANGE: 0-10, 10-50, 50-100 psi. **ACCURACY OF SETTING UNDER ALL TEST CONDITIONS:** 0.5 psi at 5 psi setting; 4% at 50 psi setting; 3% at 100 psi setting. **EXTERNAL ADJUSTMENT:** Knurled nut doubly locked. **TEMPERATURE RANGE:** Minus 65° F. to plus 250° F. **PROOF PRESSURE:** 750 psi without setpoint drift. **VIBRATION:** Up to 2000 cps. at 20g. Integral vibration isolation provided between mounting bracket and switch body (see illustration). **OVER-ALL DIMENSIONS:** Switch proper 2" diameter. Length 4⅜". Mounting bracket to suit application. **WEIGHT:** 9 ozs.

Hydraulic Pressure Switch, Type 6891

PRESSURE ADJUSTMENT RANGE: 500 to 3000 psi. **ACCURACY OF SETTING:** ±60 psi. **RESET VALUE:** 100 psi. **TEMPERATURE RANGE:** Minus 65° F. to plus 275° F. **PROOF PRESSURE:** 4500 psi without setpoint drift. **VIBRATION:** MIL-E-5272A Procedure I. **OVER-ALL DIMENSIONS:** Height 2¼". Width 2¼". Length 4-19/64". **WEIGHT:** 15 ozs.

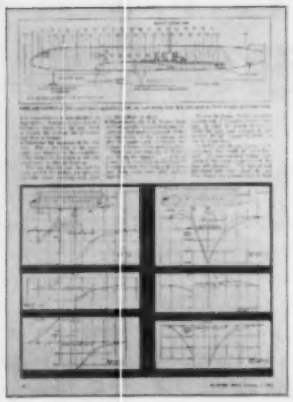
MANNING, MAXWELL & MOORE, INC.

AIRCRAFT PRODUCTS DIVISION • DANBURY, CONN. • STRATFORD, CONN. • INGLEWOOD, CALIF.

OUR AIRCRAFT PRODUCTS INCLUDE: TURBOJET ENGINE TEMPERATURE CONTROL AMPLIFIERS • ELECTRONIC AMPLIFIERS PRESSURE SWITCHES FOR ROCKETS, JET ENGINE AND AIRFRAME APPLICATIONS • PRESSURE GAUGES THERMOCOUPLES • HYDRAULIC VALVES • JET ENGINE AFTERBURNER CONTROL SYSTEMS.

AERONAUTICAL ENGINEERING

RAE Engineers Solve Comet Mystery



The Biggest Aviation News for

"SCIENTIFIC DETECTION HELPS RAE ENGINEERS SOLVE COMET MYSTERY"

This highly informative technical article again typifies the outstanding engineering reporting made available to AVIATION WEEK subscribers . . . by the largest and most highly skilled staff of graduate engineer-editors serving any aviation publication. In this case the story was written by David A. Anderton, Senior Engineering Editor, whose biography appears in this advertisement. It has received international interest and acclaim.

In the fast-moving aviation business, engineers and management men want to get their engineering information delivered to them while it is still news, not months later. They need this information to make daily decisions affecting the well-being and progress of the country's largest single business—aviation. These men have learned long ago that it is only through the perceptive reporting and fast publishing schedule of AVIATION WEEK that these important requirements can be met.

DAVID A. ANDERTON, AVIATION WEEK's senior Engineering Editor, holds a Bachelor of Aeronautical Engineering degree from Rensselaer Polytechnic Institute, and has completed additional post-graduate studies at Princeton University and Union College. His professional experience began in 1941 with Grumman Aircraft Engineering Corp., where he was a production group leader on wing design of the TBF-1 torpedo bomber. While at Grumman, Mr. Anderton served in various capacities as Liaison Engineer Between Grumman and Eastern Aircraft Division of General Motors Corp.; in work on aircraft performance and powerplant problems in Grumman's Aerodynamics Department; and in Grumman's Preliminary Design Group on pioneering work with jet aircraft layouts. After his work at Grumman, Mr. Anderton served as Aerodynamicist for the Lark guided missile at Ranger-Lark Division of Fairchild Engine & Airplane Corp.

Mr. Anderton joined the General Electric Company in 1946, on GE's Hermes guided missile project. During his first 14 months with GE, he worked alone on preliminary design for a long range rocket missile. He was then named Project Engineer on GE's Hermes B missile with responsibility for its overall design and successful functioning. After completing his work on the Hermes project, Mr. Anderton joined the editorial staff of AVIATION WEEK.

AVIATION

McGraw-Hill Publishing Company, Inc., 330 West 42nd Stret, New York 36, N. Y.: Other Advertising Sales Offices: Atlanta 3, Ga., 801 Rhodes-Haverly Bldg. Boston 16, Mass., 350 Park Square Bldg. Chicago 11, Ill., 520 N. Michigan Ave. Cleveland 15, Ohio, 1510 Hanna Bldg. Dallas 1, Texas, First

93% Verified Readership

Readex Measurement

February!

Mr. Anderton is a member of the Institute of the Aeronautical Sciences, Society of Automotive Engineers, American Rocket Society, Sigma Xi (national honorary engineering society), and Aviation Writers Association.

FOUR MONTH BOX SCORE for top aviation news

NOVEMBER

Engineering Article, "DC-7C Challenges Turbine Transports," by Senior Engineering Editor David A. Anderton

DECEMBER

Engineering Article, "Wright Pushes 'Supercharged' Turboprop," by Senior Engineering Editor Irving Stone

JANUARY

Headline News Article, "Guided Missile Program Reaches Pay-Off," by Military Editor Claude Witze

FEBRUARY

Engineering Article, "Scientific Detection helps RAE Engineers Solve Comet Mystery," by Senior Engineering Editor David A. Anderton

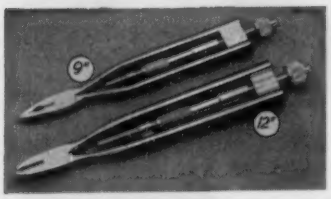
WEEK

A McGRAW-HILL PUBLICATION

ABP ABC

National Bank Bldg. **Detroit 26, Mich.,** 826 Penobscot Bldg., **London E. C. 4, England,** 95 Farringdon Street. **Los Angeles 17, Calif.,** 1111 Wilshire Blvd. **Pittsburgh 22, Pa.,** 738-9 Oliver Bldg. **Philadelphia 3, Pa.,** 17th and Sansom Streets. **San Francisco 4, Calif.,** 68 Post Street. **St. Louis 8, Mo.,** Continental Bldg.

Save ⅔ of your Wire Twisting Costs



ROBINSON WIRE TWISTERS

reduce safety wiring labor costs as much as $140 per engine. Split second twirling action wires 3 engines in time required for one by any other method.

Approved and used by military and civilian installations all over the world.

3-tools-in-1: Pliers . . . Cutters . . . Twisters. 12" and 9" length, $20.50 and $19.50 each, FOB Sacramento.

Unconditional guarantee! Write for details including specifications, testimonials and list of users. RALPH C. ROBINSON CO., Box 494C, North Sacramento 15, Calif.

HEAT & VENT RESEARCH ENGINEERS

B.S. degree in Mechanical or Aero. Engineering or equivalent, preferably with major coarses in Fluid Mechanics, Thermodynamics and Heat Transfer. Background should include 2 years of laboratory work involving fluid flow testing with emphasis on high pressure and temperature instrumentation.

Write or Apply

Engineering Personnel Office, Dept. A

NORTH AMERICAN AVIATION

Columbus 16, Ohio

USAF Contracts

Following is a list of recent USAF contracts announced by Air Materiel Command.

Aerosonic Instrument Corp., Cincinnati, indicator, airspeed, engineering and maintenance data, $194,982.

Airborne Accessories Corp., Hillside 5, N. J., actuators rescue door-rotary, 18 ea.; actuator clutch, 197 ea.; actuator assy., aileron tab, $107,859.

Bell Aircraft Corp., Helicopter Div., Ft. Worth, type H-13H helicopters spares kit tech rep services handbooks, 2 ea., $136,137.

Bendix Aviation Corp., Eclipse Pioneer Div., Teterboro, N. J., Machmeter, type A-2B, $47,393; starter, aircraft, 212 ea., $45,134.

Bill Jack Scientific Instrument Co., Solana Beach, Calif., special tools and ground handling equipment, spares for item, $270,000.

Curtiss-Wright Corp., Propeller Div., Caldwell, N. J., spare parts and data, $1,548,136.

Electrical Engineering and Mfg. Corp., Los Angeles 6, shafts, box assys., motors and data, $33,155.

Fairchild Camera and Instrument Corp., Syosset, N. Y., special tools and ground handling equipment, $26,954.

General Electric Co., West Lynn, Mass., generator assemblies, 119 ea., $111,607; indicator; tachometer electric, 29 ea., $202,596; 100 amp. transformer, rectifiers and data, 834 ea., $300,760; 50 amp. transformer, rectifiers and data, $77,875.

General Motors Corp., Allison Div., Indianapolis 6, J33-A-18A turbojet engines, 97 ea., $680,940.

Goodyear Tire and Rubber Co., Akron 16, Ohio, wheel assemblies, 4,816 ea., 225 ea., $157,854.

Ketay Instrument Corp., New York, indicator; tachometer, 2,950 ea., $199,425.

Lewis Engineering Co., Naugatuck, Conn., indicator, temperature, $27,748.

Ryan Aeronautical Co., San Diego, Calif., nacelles, parachutes and control switches, $31,333.

Simmon Bros., Inc., Long Island City, N. Y., enlarger, 61 ea., $29,253.

Borg Equip. Div., Geo. W. Borg Corp., Janesville, Wis., indicators, $532,000.

Burton Mfg. Co., Los Angeles, Calif., Machmeter, $224,871.

Control Engr. Corp., Norwood, Mass., amplifiers, $162,770.

Del Mar Engr. Labs., Inc., Los Angeles, Calif., universal tow reels, 5 ea.; banner pads, 5 ea., $195,528.

Douglas Aircraft Co., Inc., Long Beach, Calif., airplanes, $128,447,632.

Electronics Div., American Machine & Foundry Co., Boston, Mass., ground radar beacon jamming simulator, 40 ea., $100,668.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., starter, 1,392 ea., $305,961; indicator, manifold pressure, $130,896.

General Electric Co., Schenectady, N. Y., acft. generator, 406 ea., $149,814.

Jack & Heintz, Inc., Cleveland, Ohio, starter, a/c, Type K-1, 368 ea., $87,786; starter, 1,184 ea., $252,472.

Kollsman Instrument Corp., Elmhurst, N. Y., computer & transmitter, $563,887.

Lear, Inc., Grand Rapids, Mich., actuators, screwjacks and flexible shafts, $343,359.

Mole Richardson Co., Hollywood, Calif., photographic kit, 32 ea., $63,676.

Pako Corp., Minneapolis, dryer, print, 79 ea., $32,322.

Pesco Products Div., Borg-Warner Corp., Bedford, Ohio, motor assys., $77,966.

Propeller Div., Curtiss-Wright Corp., Caldwell, N. J., spare parts for Turbolectric propellers and controls, $100,000.

Radio Corp. of America, Engr. Prod. Div., Camden, N. J., comparator, 347 ea., signal mountings, 235 ea., indicator, 466 ea., $289,421.

The Rand Corp., Santa Monica, Calif., facilities for the air defense system, $226,837.

Red Bank Div., Bendix Aviation Corp., Eatontown, N. J., motor generators & data, $1,156,877.

Varo Mfg. Co., Inc., Garland, Texas, acft. circuit tester spare parts, 644 ea., $156,472.

Westinghouse Electric Corp., Dayton, Ohio, generators, 4,067 ea., 444 ea., $330,745.

Wollensak Optical Co., Rochester, N. Y., motion pictures camera, 23 ea., $55,923.

B. F. Goodrich Co., Dayton, Ohio, brake assys., 2,349 ea., wheel assys., 1,216 ea., $2,299,424; wheels, 540 ea., $27,315.

Bendix Products Div., Bendix Aviation Corp., South Bend, Ind., brake assys., 5,078, $1,382,891.

Red Bank Div., Bendix Avia. Corp., Eatontown, N. J., inverters, 500 ea., $543,035.

Federal Telephone & Radio, Clifton, N. J., antenna, 998 ea., $250,240.

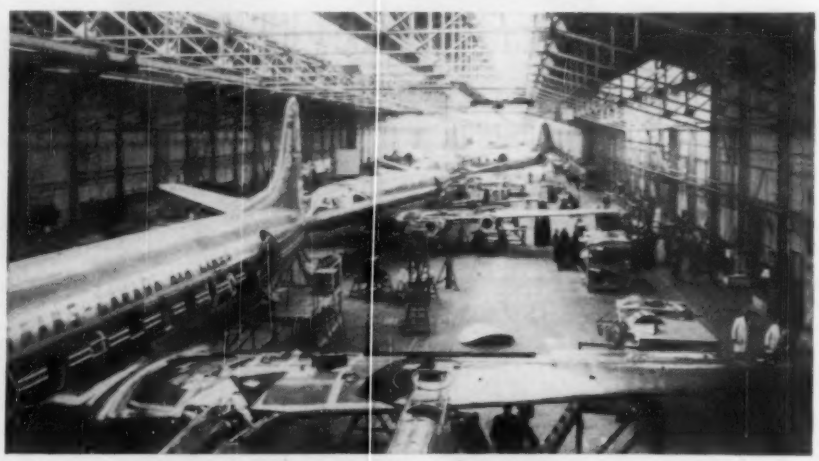
Indus. Design Lab., Culver City, Calif., contr. assys., 739 ea., $98,637.

Jack & Heintz, Inc., Cleveland, Ohio, motor generators, 2,500 ea., $662,623.

Leland Elec. Co., Div. American Machine & Foundry Co., Dayton, Ohio, inverters, $387,553; inverters, 383 ea., 166 ea., $174,292.

Engr. Prod. Div., Radio Corp. of America, Camden, N. J., radio set, $3,399,313.

Tufts College, Medford, Mass., service test items for project 119L, 75 ea., $560,000.



Viscount Production Gets Into Stride

Output of Vickers-Armstrongs' Viscount turboprop airliners for export is being increased at the company's Hurn, England, plant. Nearing completion in the foreground are some of the 22 transports on order by Trans-Canada Air Lines.

Navy Contracts

Contracts recently announced by the Navy's Aviation Supply Office, 700 Robbins Ave., Philadelphia 11, are:

Air Cruisers Co., division of the Garrett Corp., Belmar, N. J., life vests, 5,500 ea., $140,250.

AiResearch Mfg. Co., the Garrett Corp., Los Angeles 45, valve assys., 188 ea., $39,-800.

Andrew Brown Co., Los Angeles 22, lacquer, 16,008 gal., $38,660.

Atlas Paint and Varnish Co., Irvington 11, N. J., enamel, 110,000 gal., $206,150.

Aviators Clothing Co., Inc., Beacon, N. Y., outer garment for anti-exposure MK-4 and kits, $132,132.

Bendix-Skinner Div., Bendix Aviation Corp., Royal Oak, Mich., filters, maintenance parts for F9F-6 and various other aircraft, $26,-745.

Chiksan Co., Brea, Calif., joints, $34,613.

Cook Electric Co., Chicago 14, relays, $33,-672.

Douglas Aircraft Co., Inc., Santa Monica, Calif., maintenance parts used on strut assys., $84,580.

Enmar, Inc., Wichita 1, Kan., lacquer, 17,-106 gal., $38,660.

Federal Mfg. and Engineering Corp., Brooklyn 5, N. Y., signal generators, 261 ea., $328,829.

George Senn, Inc., Philadelphia 24, compound, $48,128; compound, $40,908.

Goodyear Tire and Rubber Co., Inc., Akron 16, Ohio, brake linings, 11,574 ea., $26,699.

Hub Paint and Varnish Co., Inc., Long Island City 1, N. Y., enamel, 12,084 gal., $31,452.

Lockheed Aircraft Corp., Burbank, Calif., parts, maintenance, P2V aircraft, $29,685.

Orr and Sembower, Inc., Reading, Pa., preservation units, $70,724.

Sears, Roebuck and Co., Paint and Varnish Factories, Philadelphia 24, resin, 19,000 gal., $34,470.

Switlik Parachute Co., Inc., Trenton, N. J., parachute assys., 1,215 ea., $232,065.

Thompson Products Inc., Cleveland, Ohio, fuel pump assys., 735 ea., $129,411.

Titanine, Inc., Union, N. J., lacquer, 24,510 gal., $54,340.

B. K. Sweeney Mfg. Co., Denver, tools, $45,941.

Bendix Products Div., Bendix Aviation Corp., South Bend, Ind., carburetor, 31 ea., $108,953; carburetors, 30 ea., $29,570.

Brooklyn Paint and Varnish Co., Inc., Brooklyn 1, N. Y., varnish, 16,986 gals., $29,307.

Enmar, Inc., Wichita 1, Kan., dope, cellulose nitrate, $69,464.

Hydro-Aire, Inc., Burbank, Calif., valves, $50,620.

Joy Mfg. Co., New York 6, blowers, 121 ea., $36,863.

Link Aviation, Inc., Binghamton, N. Y., bellows assys., disc assys., wheel assy., indicator assy., parts, $41,654.

Lockheed Aircraft Corp., Burbank, Calif., generator and alternator drives, 13 ea., $62,308.

Monadnock Mills, San Leandro, Calif., fasteners, $26,582.

New York Air Brake Co., Watertown, N. Y., hyd. pumps, $132,638.

North American Aviation, Inc., Columbus Div., Columbus 16, Ohio, maintenance parts for AJ aircraft, $45,643; parts for AJ-1, SNJ aircraft, $32,433.

Permutit Co., New York 36, desalter kits, 10,500 ea., $118,020.

Roflan Co., Topsfield, Mass., microphone assys., 13,321 ea., $56,614.

Scintilla Div., Bendix Aviation Corp., Sidney, N. Y., magneto distributors, $88,368.

United Aircraft Products, Inc., Dayton 1, Ohio, fuel pumps, $52,142.

Vickers, Inc., Detroit 32, motor assys. and hyd. pumps, $103,115.

Weber Aircraft Corp., Burbank, Calif., triple passenger seats, 52 ea., $31,314.

All Steel Fabricators Co., Inc., Philadelphia 27, stands, 44 ea., $41,668.

American Zinc Sales Co., Columbus, Ohio, pigment, $468,000 lb., $62,525.

Contract Hearings

Hearings on Defense Department procurement policies will be started Apr. 4 by a Senate Small Business subcommittee, headed by Sen. George Smathers.

Among other matters, the subcommittee plans to consider Defense Department's directive on the maintenance of the mobilization base and the portion of direct and subcontracts going to small business.

Sen. Edward Thye, ranking Republican on the subcommittee, has complained that the Defense directive paves the way for channelling Defense business to a preferred list of contractors (AW Dec. 20, p. 12).

Andrew Brown Co. of Maryland, Inc., Irving, Tex., enamel, 15,985 gal., $29,093.

Atlas Paint & Varnish Co., Irvington 11, N. J., enamel, 19,728 gal., $35,143.

B. F. Goodrich Co., Akron 18, Ohio, boots, $134,034.

Bakelite Co., New York, resin, 72,000 lb., $37,440.

Bendix Products Div., Bendix Aviation Corp., South Bend, Ind., maintenance parts, $156,839.

Coast Pro-Seal & Mfg. Co., Los Angeles, compound, 5,000 gal., $36,450.

Cook Paint & Varnish Co., North Kansas City, Mo., enamel, $26,800.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., maintenance parts used on oxygen regulators, valve assys., aneroid assys., $40,044.

Frey-Yenkin Paint Co., Columbus, Ohio, paint, 15,900 gal., $31,323.

Lite Mfg. Co., Inc., New York 11, accessory kits, 636 ea., $158,033.

Lord Mfg. Co., Erie 6, Pa., mounts, 1,199 ea., $85,345.

McDonnell Aircraft Corp., St. Louis 3, maintenance parts for F2H aircraft, $75,723.

National Lead Co., Philadelphia 25, pigment, red lead, 288,000 lb., $49,626.

New Jersey Zinc Sales Co., New York 38, pigment, 360,000 lb., $51,660.

Pacific Vegetable Oil Corp., San Francisco 7, oil; linseed, 22,500 gal., $29,860.

Rubber Fabricators, Inc., Grantsville, W. Va., rafts, 1,268 ea., $215,484.

Sears, Roebuck & Co., Paint and Varnish Factories, Philadelphia 24, paint, 36,032 gal., $49,373.

Sherwin-Williams Co., Philadelphia 3, paint, 5,000 gal., $26,820.

Thompson Products, Inc., Cleveland 17, Ohio, pump assys., $36,750.

Weston Hydraulics, Ltd., North Hollywood, Calif., valves, 167 ea., $30,059.

Parker Aircraft Co., 5827 W. Century Blvd., Los Angeles 45, Calif., valve assy. Hydraulic for FJ-2, -3 aircraft, 110 ea., $44,226.

Permoflux Corp., 4900 W. Grand Ave., Chicago 39, Ill., headsets, cushion earphone, 2,779 ea., $55,310.

R. C. Allen Business Machines Corp., 678 Front Avenue, N.W. Grand Rapids, Mich., indicator, electric turn and bank & spare parts, 828 ea., $70,837.

Radiant Manufacturing Co., 2627 W. Roosevelt Road, Chicago 8, Ill., target, banner for vertical towing, 3,000 ea., $231,570.

Scintilla Div., Bendix Aviation Corp., Sherman Ave., Sidney, N. Y., parts for use on Pratt and Whitney R4360 aircraft engines, $326,384.

Stewart-Warner Corp., South Wind Div., 1514 Drover St., Indianapolis, Ind., heat exchange for P4Y-2 aircraft, 313 ea., $107,-594.

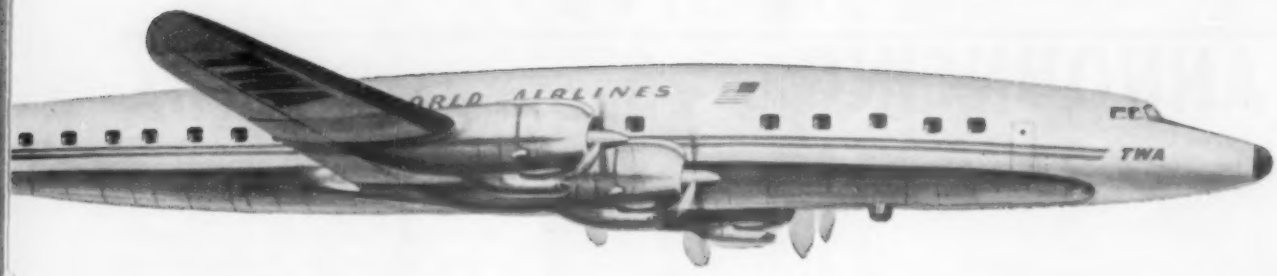
Sundstrand Machine Tool Co., Aviation Div., 2421 Eleventh St., Rockford, Ill., transmissions and governor assys., 231 ea., $972,741.

marion
advancement in instrument design
new COAXIAL* relay
Actual Size
Weight 1.5 oz.
Very sensitive, rugged, reliable. Hermetically sealed.
Engineering data for your application on request.
*Trademark for the basic Marion moving coil mechanism. Patents Pending.
marion electrical instrument co.
419 Canal St., Manchester, N. H., U. S. A.
Manufacturers of Ruggedized and "Regular" Panel Instruments and Related Products.
copyright 1955 M.E.I. Co.
marion meters

A precision ball joint connector designed & developed by Skyline

SKYLINE
PRECISION SHEET METAL & MACHINE PARTS
COMPLETE ENGINEERING SERVICE
A.F. CERTIFIED SPOT WELDING & OTHER WELDING PHASES
ELECTRONIC PARTS AND EQUIPMENT
AIRCRAFT FABRIC COVERING
GALLEYS AND COMMISSARY EQUIPMENT
GROUND SERVICING EQUIPMENT
SKYLINE PRODUCTS INC.
GRAND BOULEVARD, DEER PARK, NEW YORK

TWA



DISCOVER A NEW HIGH IN AIR TRAVEL...

TWA's great new SUPER-G CONSTELLATIONS

LARGEST, MOST LUXURIOUS AIRLINERS IN THE SKIES TODAY!

Created by Lockheed especially for TWA!

Powered by Curtiss-Wright's newest Turbo-compound engines!

Interior by Henry Dreyfuss, world-famous designer!

Step aboard and enjoy the most delightful *non-stop* service between major cities coast to coast. For TWA's great, new Super-G Constellation is a perfect combination of outstanding speed and supreme luxury — a combination never before dreamed possible aloft!

Every feature of this new giant of the skyways is a tribute to painstaking planning and engineering — such scientific advances as a nose equipped for radar that "sees" weather a hundred miles ahead — such luxuries as the glare-free picture windows that give you a better view of the world below. You can sit back and relax in one of the four spacious cabins (yes, four!) . . . or sleep away the miles in your own full-length berth. Special soundproofing quiets the four mighty engines to a reassuring hum.

Scores of other features will delight you, too . . . the richly decorated lounge where you can enjoy pleasant conversation with fellow passengers, three beautifully appointed lavatories, adjustable reading lights, handy baggage racks, wood-paneled interiors, much more. And TWA's traditionally superb service matches the luxurious setting every moment you're aboard.

Plan to be one of the first to fly TWA's great, new, luxurious Super-G Constellations. For information and reservations, see your TWA travel agent or call your nearest Trans World Airlines ticket office.

Fly the finest... **FLY TWA**

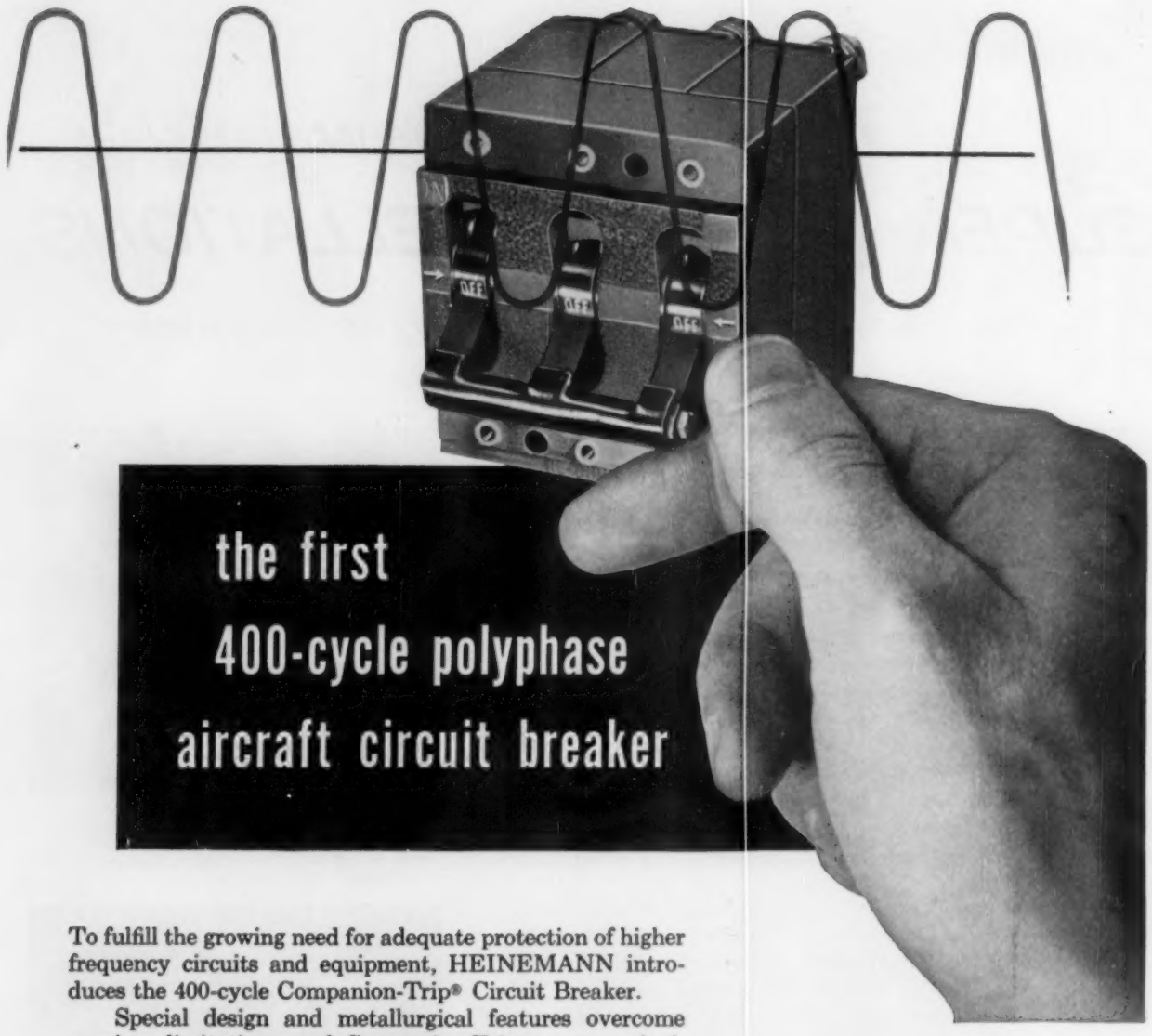
TRANS WORLD AIRLINES

U.S.A. • EUROPE • AFRICA • ASIA

Finest food in flight! Enjoy superb full-course meals right at your seat. Order your favorite drink from TWA's full selection of beverages. Select a perfect snack from TWA's bountiful variety of canapés, rare cheeses and fresh fruits. All complimentary, naturally!

Sleep away the miles in a wide, full-length sleeper berth that is even roomier than rail berths! In the morning, awaken to a piping-hot breakfast served right in bed by your TWA hostess. It's the only air sleeper service between New York and California.

ANNOUNCING...



the first 400-cycle polyphase aircraft circuit breaker

To fulfill the growing need for adequate protection of higher frequency circuits and equipment, HEINEMANN introduces the 400-cycle Companion-Trip® Circuit Breaker.

Special design and metallurgical features overcome previous limitations, and Companion-Trip—a new principle—provides complete phase isolation.

The new aircraft type circuit breaker is hydraulic-magnetic, of course. Current carrying capacity and set tripping points are completely unaffected by ambient temperature.

Moreover, a selection of time delay response curves permits overload protection to be fitted to the precise requirements of your equipment.

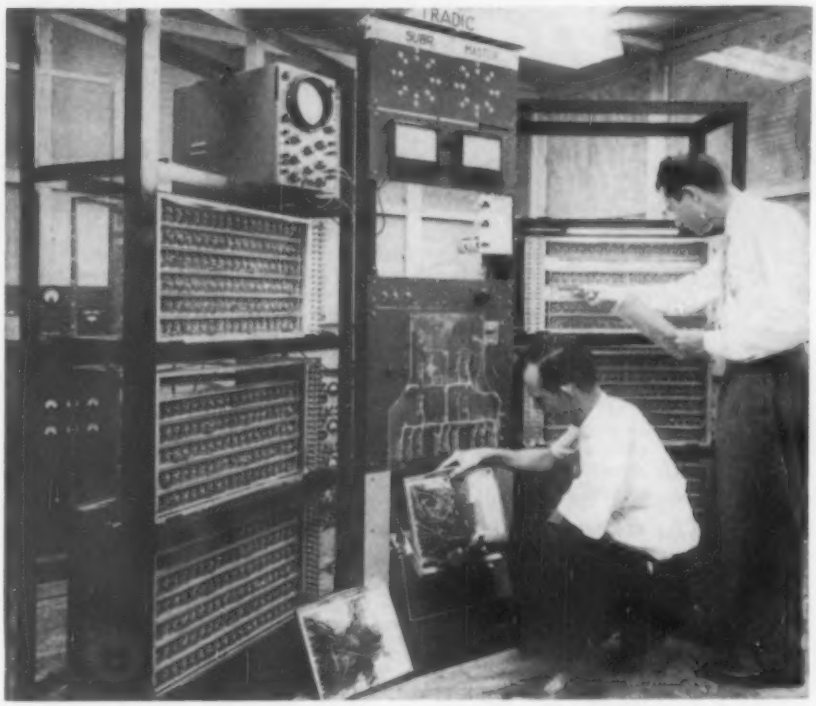
For complete information, request Bulletin T-3301.

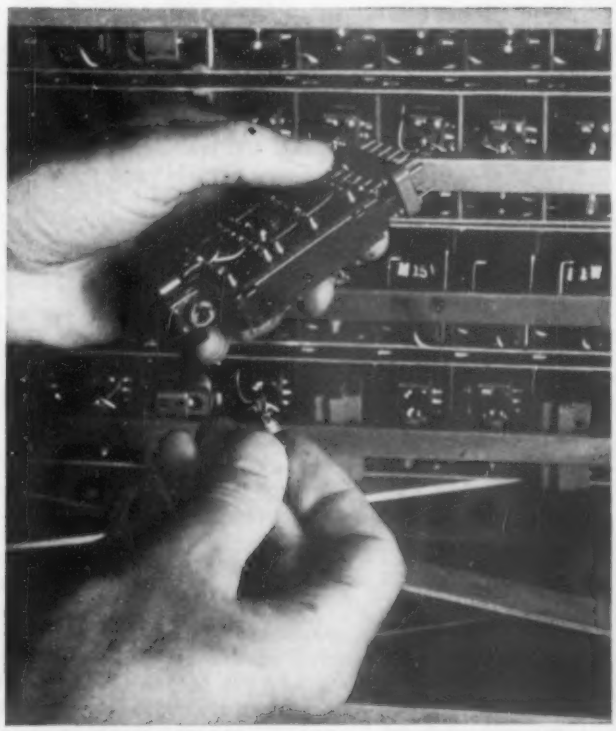
HEINEMANN *Circuit breakers*

HEINEMANN ELECTRIC COMPANY
158 Plum Street • Trenton 2, New Jersey

Airborne Computer Uses 800 Transistors

TRADIC, first transistorized digital computer designed for airborne use, employs transistors throughout, except in power supply, enabling device to operate on less than 100 watts—only one-twentieth the power needed by a comparable computer using vacuum tubes. Use of transistors will eliminate the problems of tube failure and heat. The laboratory model shown at right is expected ultimately to occupy less than 3 cu. ft. when design is finished, perhaps three-fifths the space required for an analog computer which can do the same job. Tradic operates in serial fashion at a 1-mc. pulse rate, using 16-digit binary numbers (AW Aug. 9, 1954, p. 46). Machine can add or subtract in 16 microseconds, multiply or divide in 300 microseconds. Fundamentally a digital computer, it can operate on analog data. Tradic (TRAnsistor-DIgital-Computer) was developed by Bell Telephone Labs in cooperation with Wright Air Development Center.





PLUG-IN PACKAGES, like transistor memory unit shown above, simplify computer construction and maintenance. Tradic uses 800 transistors and 11,000 diodes. Experience to date indicates that transistorization improves computer reliability.

SOLUTION TO TRIGONOMETRIC problems computed in lab model are displayed here on an oscilloscope. In tactical use, Tradic might compute interception courses or serve as a bombing and navigation computer.

Engineers! Scientists!

UNLIMITED OPPORTUNITIES IN

Atomic Power

AT

Westinghouse

In a new plant on the outskirts of Pittsburgh, Pa., atomic energy will be explored as a source of power for transportation and industry.

Opportunities in this new field are unlimited for:

MECHANICAL ENGINEERS

Fluid flow, heat balance, valves, mechanical and hydraulic devices and mechanisms, design and application of high pressure piping and systems, heat transfer, rotating machinery, general steam apparatus and steam power systems.

ELECTRICAL AND CONTROL ENGINEERS

Development, design and application of control systems and apparatus for nuclear plants. This includes servo analysis, application of analog computers, functional and operational analysis of mechanical and electrical power systems and the application of temperature, pressure, flow instruments, nuclear instruments, motor controllers, regulators, control panels and special electrical controls.

PHYSICISTS

Basic reactor physics, reactor design and analysis, control systems, and experimental testing.

METALLURGISTS

To conduct basic research in physical metallurgy, corrosion and radiation effects on metals; applied research and development on materials and processes for reactor components in the field of vacuum induction melting, ceramics, powder metallurgy, welding, metal working and non-destructive inspection.

Openings also exist for Chemical Engineers, Chemists, Radio Chemists and Dynamic Analysts.

SALARIES

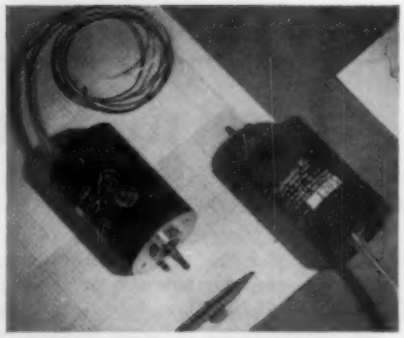
Open. Ample housing available. Benefits include a hospitalization-insurance program, and graduate study under the Westinghouse program at company expense.

HOW TO APPLY

United States Citizenship is required!

Send resume concerning your experience and education to:

Mr. C. F. Stewart, Atomic Power Division,
Westinghouse Electric Corporation
P.O. Box 1468, Pittsburgh 30, Pa.



LOW-SLIP MOTOR delivers 15 watts.

New Mag Amplifiers For Servo Systems

A new line of 400 cps. self-saturating mag amplifiers, designed for use with BuOrd-type servo motors in half-wave circuits requiring bandwidths up to 20 cps., is one of several recently announced devices of interest to servo system designers.

The new mag amplifiers are available in three models, each with an input impedance of 10,000 ohms, response time of 0.005 sec. and an operating temperature range of −55C to 80C.

Model B-1, designed for use with BuOrd's Mk 7 motor, has a power gain of 50,000, weighs 1½ lb.; Model B-3 is functionally similar but is designed for a Mk 8 motor. Model B-2, for use with a Mk 14 Mod 2 motor, has a power gain of 110,000, weighs 2 lb.

Manufacturer: Feedback Controls, Inc., 1332 North Henry St., Alexandria, Va.

Other new servo components:

• **Low-slip 400 cps. motor,** Type AC-93, is a one-phase, 115-volt motor with a locked-rotor torque of 1.8 oz.-in. minimum and capable of delivering 15 watts output at 11,800 rpm. Maximum power input is 45 watts, and rotation is reversible. Weight is 14 oz. Special models are available as synchronous motors, with reduced power output.

Manufacturer: Dalmotor Co., 1315 Clay St., Santa Clara, Calif.

• **Motor-tach generator** consists of a single- or double-phase, 60- or 400-cps. servo motor driving a permanent magnet generator whose output voltage gradient can be as high as 20 volts/1,000 rpm. Motor output torque is in the order of 0.15 oz.-in., depending upon power input. Combined motor-generator measures approximately 1 in. dia. x 2½ in. long, weighs 6.3 oz. and can be provided to operate over temperature range of −65F to 300F.

Manufacturer: G-M Laboratories, Inc., Department "F," 4300 North Knox Ave., Chicago 41.

• **Corrosion-resistant synchro,** Size 11,

• FOR FLIGHT TEST INSTRUMENTATION

PRECISION SUBCARRIER DISCRIMINATOR

• FOR MULTIPLEXED FREQUENCY MODULATED INSTRUMENTATION SYSTEMS

Performance obtained from EMR's new Model 67 Precision Subcarrier Discriminator indicates that it will supersede existing subcarrier discriminators used in frequency modulated telemetering and data recording systems, and will establish new standards for systems now in design.

The new instrument incorporates a Band Pass Input Filter, Frequency Determining Network, and an interchangeable Low Pass Output Filter in a single front panel plug-in unit. Three outputs are provided, one of which will drive most pen motors to full deflection. Each discriminator contains its own electronically regulated power supply.

The Model 67 Discriminator is linear within 0.1%, slope is constant to ±0.25%, and long-term zero drift does not exceed 0.5% (all referred to full bandwidth). Wide range base line limiting of the subcarrier eliminates amplitude modulation effects and reduces the effect of step function changes encountered in magnetic tape dropouts to a minimum.

Of special interest is the fact that this discriminator provides constant time delay of intelligence through a subcarrier channel, permitting reduction of recorded or transmitted multiplexed data occurring at max. intelligence frequencies with errors of less than 1% of bandwidth. Complete compensation for speed change error in tape recorded data can be provided.

Further information, including detailed characteristics of the instrument, may be obtained by writing Sales Engineering Department, Electro-Mechanical Research, Inc., Ridgefield, Conn.

CHARACTERISTICS

The basic discriminator unit is operable over the frequency ranges and deviations stated. The Channel Selector unit, including Band Pass Input Filter, Frequency Determining Network, and Output Filter establish subcarrier center frequency, deviation, and intelligence bandwidth.

Frequencies available	400 cps to 100 Kc.
Subcarrier frequency deviation	Up to ±50% of Center Frequency.
Intelligence frequency	From DC to as much as 30% of Center Frequency.
Harmonic distortion	Less than 1%.
Input impedance	0.5 megohms shunted by approx. 20 mmfd.
Input range	Dynamic range for any input level setting is 30 db. 10 mv minimum input.
Amplitude modulation and tape drop out	50% square wave amplitude modulation of subcarrier results in change in output amplitude equivalent to less than 1% of bandwidth.
Output	Single ended and referred to ground. Will drive most pen motors or other recording devices to full scale.
Output limiters	Output amplifier is designed to limit at ±20 ma.
Linearity of output vs subcarrier frequency	Within 0.1% of bandwidth.
Output stability	Zero drift does not exceed 0.5% of bandwidth in a 15-hour period.
Sensitivity stability	Within ±0.25% of bandwidth.
Max. output noise	Equivalent to less than 0.1% of bandwidth.
Power source	105-125 volts, 60 cps, 170 watts, unregulated.

Speed change error compensation analysis for system using Model 67 Discriminator

$$N_r = \frac{N}{100}\sqrt{1 + .0042\left(\frac{f_t}{f_d}\right)^2 I^2}$$

where

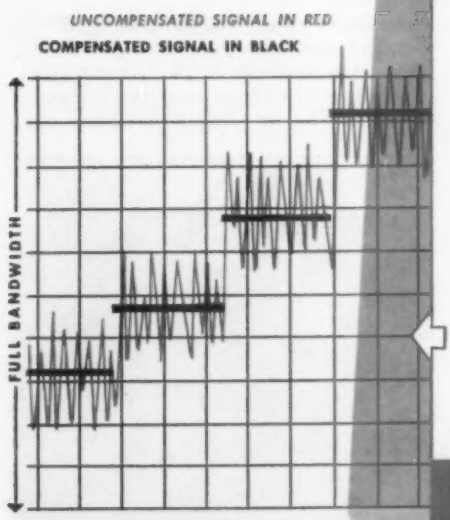
N_r = peak to peak residual wow or flutter component after compensation at frequency f_t in percent of bandwidth.

N = peak to peak amplitude of uncompensated wow or flutter component at frequency f_t in percent of bandwidth.

f_t = wow and flutter frequency component under consideration, in cps.

f_d = one half of bandwidth for channel in question, in cps.

I = carrier offset from center frequency in percent of half bandwidth.



UNCOMPENSATED SIGNAL IN RED

COMPENSATED SIGNAL IN BLACK

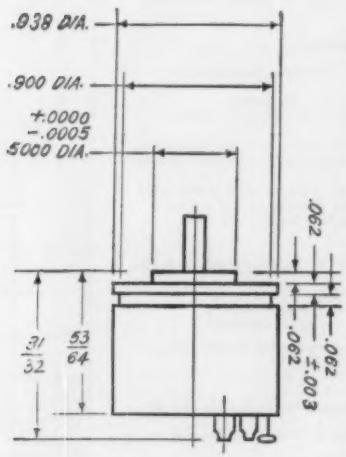
Electronic Compensation of Magnetic Recorder Speed Change Error

3.9 Kc (±7½% Full Bandwidth) Channel

Electro-Mechanical Research, INC. e·m·r **RIDGEFIELD, CONNECTICUT**

For Immediate Delivery

- **MINIATURE A.C. MOTOR**
- **STANDARD SIZE 10 MOUNTING DIMENSIONS**
- **CLAMPED BEARING RACE CONSTRUCTION**
- **LOW PRICE**



These precision A.C. motors are superior in construction to motors previously available. Deliveries are made from stock.

Also in production are complete lines of transmitters, receivers, control transformers, resolvers and differentials of size 10, size 11 and size 15 synchros, miniature D.C. motors and other electronic components.

For full engineering information, drawings, electrical characteristics etc. write or telephone T. W. Shoop, Sales Mgr. Telephone (Phila.) MAdison 6-2101. West Coast Rep. Wm. J. Enright, 988 W. Kensington Rd., Los Angeles, Calif. MUtual 6573.

LOOK TO cppc FOR SYNCHRO PROGRESS

cppc
CLIFTON PRECISION PRODUCTS CO., INC.

CLIFTON HEIGHTS **PENNSYLVANIA**

is accurate to within 10 min. maximum deviation spread from electrical zero. It weighs 4 oz., sells for approximately $30 in transmitter and control transformer types. Other types are slightly higher. Units are available for 26 or 115 v. a.c. excitation, with high or low impedance, single- or double-ended shafts and either leads or terminals.

Manufacturer: Kearfott Company, Inc., 1378 Main Ave., Clifton, N. J.

New Two-Pole Relay Takes 20G Shocks

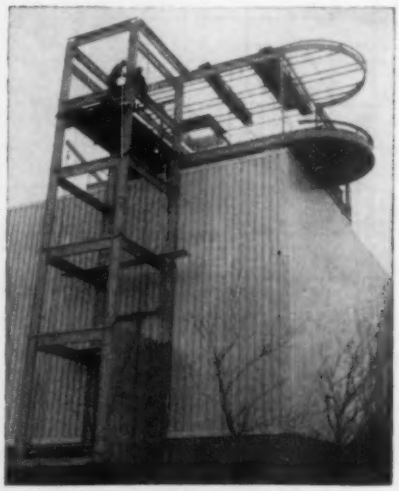
A tiny new two-pole relay, less than 1½ in. high and reportedly capable of withstanding 20G shocks at frequencies up to 2,000 without contact break, is one of several recently announced components which should aid avionic equipment designers in cutting size and weight.

The new subminiature relay, designed for operation at temperatures up to 200C, has contacts rated at 3 amp. 28 v. d.c., or 115 v. a.c., with contact life in excess of 100,000 operations. Higher contact rating is possible where shorter contact life is acceptable. Two-pole model comes with coil resistance of 325 ohms, for 28 v. d.c. operation; single-pole version is available with 520 ohm coil. Relays are hermetically sealed and filled with either dry air or nitrogen.

Manufacturer: Hi-G Inc., Bradley Field, Windsor Locks, Conn.

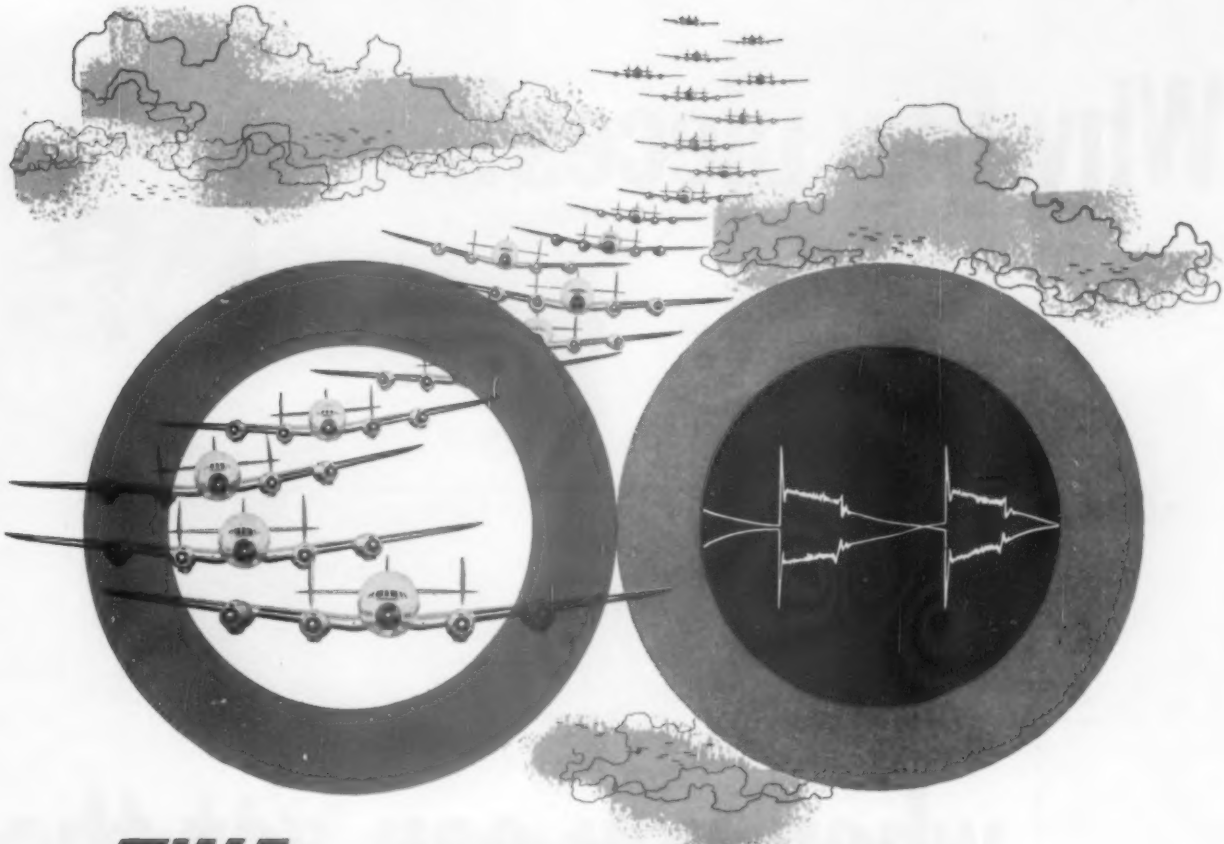
Other new miniature components include:

• **Silicon power rectifiers,** designed for high temperature operation up to 200C, are now available in 21 different types, rated up to 400 ma. continuous forward current, up to 1,000 peak inverse volt-



For B-58 Tests

Radar sighting tower, three stories high, is being constructed by Convair-Ft. Worth for use by its aerophysics lab in testing B-58 avionics equipment.



TWA's NEW SUPER-G CONNIES HAVE SPERRY ENGINE ANALYZERS

Complete New Fleet Equipped "To improve dependability and schedule reliability"

TWA Flight Engineer gets continuous picture of engine conditions, through easy-to-interpret patterns on scope of Sperry Engine Analyzer.*

With each of its 20 new Super-G Constellations equipped with Sperry Engine Analyzers, TWA gains these important advantages:

Ignition troubles can be detected before they become serious during routine pre-flight check-up. Replacements or adjustments can be made in less time, reducing possibility of take-off delays.

In the air, flight engineer can "see" performance of every spark plug and cylinder – make adjustments where possible – or provide pinpointed directions, enabling ground crew to make adjustments or repairs immediately upon landing.

Engines can be more accurately synchronized and tuned for maximum performance.

Dependability of operation is assured by Sperry precision production and backed by our world-wide service organization.

With such advantages it's easy to see why Robert W. Rummel, TWA's Chief Engineer, welcomes Sperry Engine Analyzers aboard the new Lockheed Constellations. "As a result," he points out, "improved schedule dependability and reliability should be achieved."

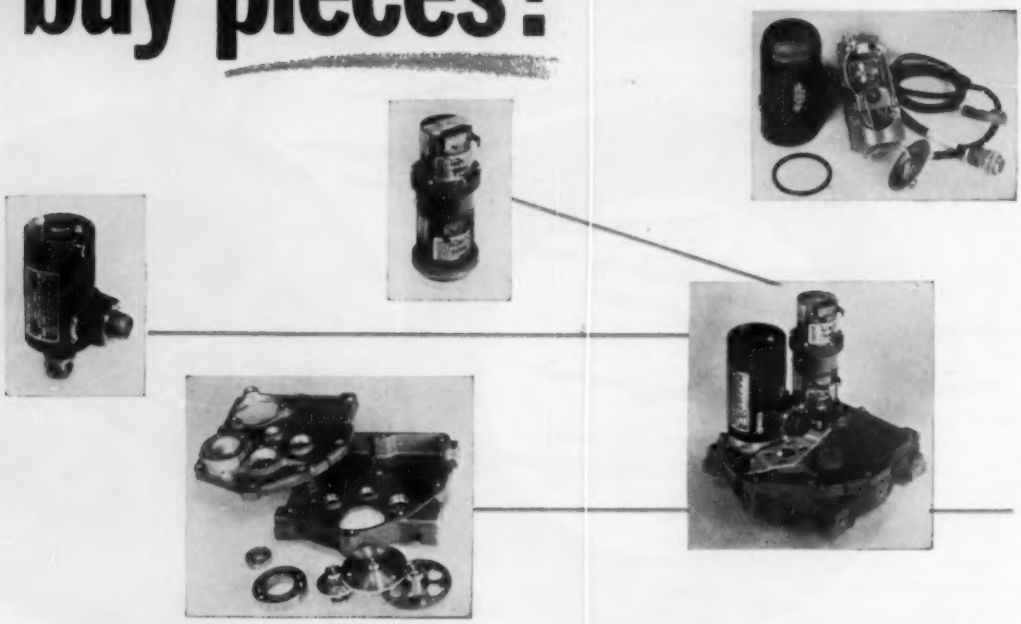
*ENGINE ANALYZER IS MANUFACTURED UNDER JOHN E. LINDBERG PAT. NO. 2514427.

SPERRY GYROSCOPE COMPANY

DIVISION OF THE SPERRY CORPORATION, GREAT NECK, NEW YORK

CLEVELAND • NEW ORLEANS • BROOKLYN • LOS ANGELES • SAN FRANCISCO • SEATTLE
IN CANADA • SPERRY GYROSCOPE COMPANY OF CANADA LIMITED, MONTREAL, QUEBEC

Why buy pieces?



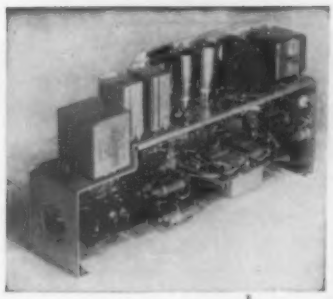
when you can get the

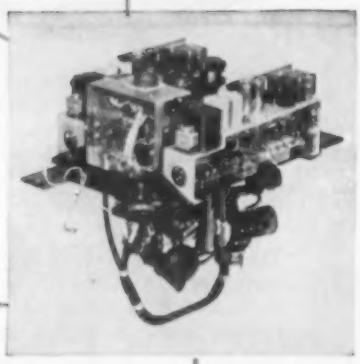
When you buy a watch, you don't buy the spring, face, hands and stem separately . . . and then try to put them together so they tell time. No! Instead you get a complete watch, tested and ready to run.

Why not buy precision aircraft equipment the same sensible way? You can, from Greenleaf . . . *one* source . . . *one* responsibility!

Take this Gyro Drive Unit, for example. It was built for our customer, Crosley Division, AVCO Manufacturing Corporation, to their specifications . . . assembled, tested and ready to install, and

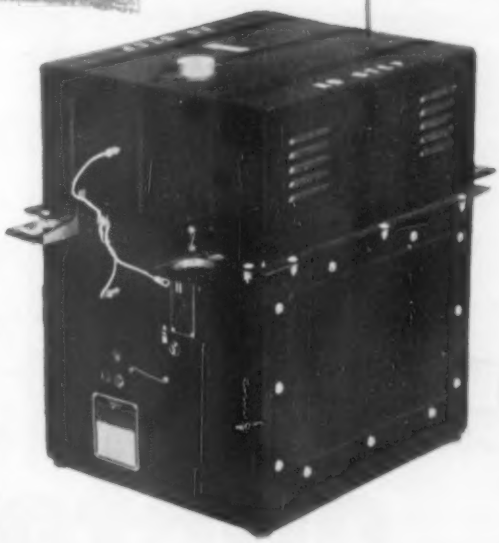
THE Greenleaf MANUFACTURING COMPANY . . .
7814 W. Maplewood Industrial Court • Saint Louis 17, Missouri





complete package

by Greenleaf



like all Crosley products, "Right and On Time." Think of the trouble this can save you. *This is the fundamental of the "Weapons System" concept!*

This Gyro Drive Unit is just one of a wide range of precision products that Greenleaf can produce for you in practical *packaged* form. For information on your specific problem, a wire or phone call will put us in touch with you immediately.

ENGINEERING • DEVELOPMENT • PRODUCTION

• • *Where quality control works on the production line producing the new HIG-3, the HIG-4 and Rate Gyros, Pressure Transmitters, Accelerometers, Synchros, Air Speed Indicators, Actuators and many other precision-built components.*

INSIDE STORY

AUSTENAL SILENT TREATMENT

This is the inside of a creep rupture machine at Austenal Laboratories. A bar of ultra-strong alloy is subjected to high stress for many hours at jet engine temperatures until it finally ruptures.

The drawing symbolizes determination of rupture strength of an alloy to be used in Austenal's Microcast process for the investment casting of high temperature components for jet engines. This is one of many laboratory tests used to ensure the quality and dependability of the alloys used.

The alloy was made in Austenal's own alloy plant. Skilled metallurgists and chemists produce alloys to pre-determined specifications and check and re-check each individual melt to ensure high quality standards.

Quality control is basic in Austenal's Microcast process. It is just one of the reasons why more jet engines use Austenal components than any other—and why American industry depends upon Austenal.

Let Austenal help solve *your* precision casting problems. Austenal Microcast can simplify and improve your entire production picture.

See Austenal's original informative 16mm color movie, "A Story of Industrial Progress". Available without charge.

austenal®

LABORATORIES, INC.

microcast division

224 EAST 39th STREET · NEW YORK 16, N. Y.

7001 SO. CHICAGO AVE. · CHICAGO 37, ILL.

age, from Bogue Electric Mfg. Co., 56 Iowa Ave., Paterson, N. J.

• **"Tiny Trim" pot** measures only ½ × ½ × ⅛ in., weighs less than two grams, and is designed to be stacked into compact banks. Unit comes with resistances of 10 to 25,000 ohms in standard models; other values on special order. New "Tiny Trim" reportedly maintains stability to 250F, has adjustment ratio of 80:1, and is shock resistant up to 100G.

Manufacturer: Daystrom Potentiometer Division, 1509 Colorado Blvd., Santa Monica, Calif.

• **Rectangular pulse transformers,** hermetically sealed, come with pulse widths of 0.4 to 10 microseconds and maximum rise time of 0.1 μs. Units occupy volume of only 0.19 cu. in., can operate up to 85C. Engineering Bulletin 502A gives application data.

Manufacturer: Sprague Electric Co., 291 Marshall St., North Adams, Mass.

• **Six-pole, double-throw relay,** submin Series 2005, is hermetically sealed and has contacts rated at 5 amp., 28 v. d.c., resistive load. Unit is designed to meet MIL-R-6106, Class A, and MIL-R-5757B, Class A, according to maker. Operating coil is designed for 28 v. d.c.

Manufacturer: Guardian Electric Mfg. Co., 1621 W. Walnut St., Chicago 12.

FILTER CENTER

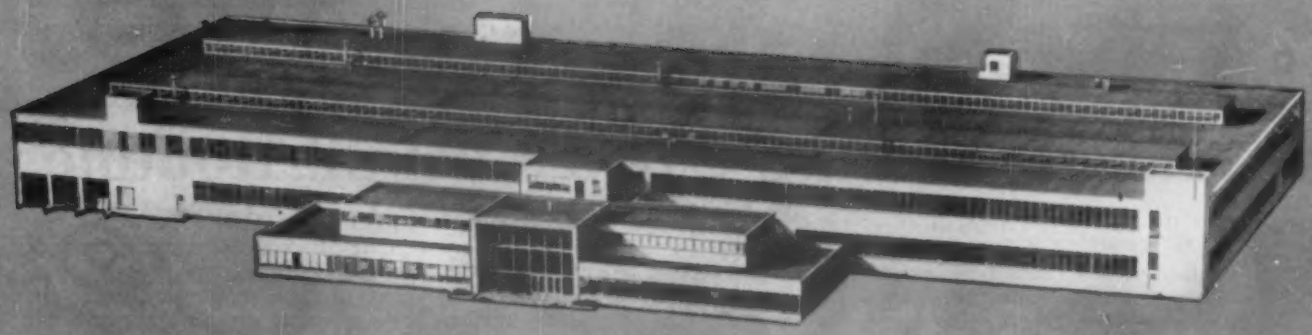
▶ **SSB Gathers Momentum**—Watch for increased numbers of new military communications equipments to employ single-sideband techniques instead of long-used double-sideband. Object is to provide increased numbers of channels and to improve intelligibility. Qualified observers expect airlines to follow military lead.

▶ **Building-Block ARC-52**—Navy's new AN/ARC-52 UHF transceiver will employ modular construction designed to permit major sub-assemblies to be packaged in a variety of shapes tailored to an individual airplane's available space. In some cases, major sub-assemblies of the ARC-52 may be mounted remote from one another in available nooks and crannies. Collins Radio, which is developing the ARC-52, reportedly plans to apply same techniques to many of its future equipments.

▶ **Arinc Buys Bendix Selcal**—Aeronautical Radio, Inc., stations at New York, Miami, San Juan, Los Angeles, San Francisco, Seattle, Honolulu and Okinawa will be equipped with new Bendix Radio selective calling equipment. Selcal enables ground station operators to alert pilot (by flashing light or buzzer) when it wishes to talk with him.

To serve you better...

The Bendix plant at Utica, N. Y., contains more than 221,000 square feet of floor space and has acquired a deserved reputation for "getting things done". Witness the fact that it was the first . . . and still is the only . . . source of self-contained fuel-air combustion starters of a qualified design on a production basis.



Utica DIVISION OF Bendix AVIATION CORPORATION

now adds complete sales, service and engineering facilities for air turbine driven accessories • air conditioning systems and components • engine starting equipment • air pressurization and ice elimination equipment • special-purpose aircraft pumps *plus* air turbine drives • flexible drive shafts • gear boxes • high-pressure fibre glass bottles • and other mechanical accessories

Bendix experience in the design and manufacture of aircraft accessories covers a span of nearly 40 years. We at Utica have been the source of manufacture for many of these products since 1951. And now, with the transfer of a complete and highly specialized sales, service and engineering organization from the Eclipse-Pioneer Division, the Utica Division combines "under one roof" all the elements necessary to a completely unified program in the field of *mechanical accessories* for aircraft.

We are convinced that this move is going to enable Bendix to serve your interests even better than in the past.

We invite your inquiry on any aviation *mechanical accessory* problem. Write Utica Division, Bendix Aviation Corporation, Utica, New York.

West Coast Office:
117 E. Providencia Ave.
Burbank, Calif.

Export Sales:
Bendix International Division
205 E. 42nd Street
New York 17, N. Y.

Utica DIVISION

Bendix AVIATION CORPORATION

GRUMMAN TIGER pilot training will be sped with aid of new Carmody synthetic trainer for schooling in F9F-9 cockpit procedures.

New Assist for Navy Pilots

Trainer Teaches F9F-9 Cockpit Routine

By George L. Christian

Buffalo—A new concept in low-cost, synthetic aircraft training devices is being prototyped here for the Navy's supersonic F9F-9 fighter by the Carmody Corp.

The equipment, named a "procedure trainer" by Edmund O. Carmody, company president, is designed to teach pilots normal and emergency cockpit procedures.

The recently organized firm is building the procedure trainer for the Grumman fighter under contract with the Special Devices Center of the Office of Naval Research.

Because of the relative simplicity of the units, the first trainers will be delivered this summer, before Tigers reach Navy squadrons, says Carmody. Speedy delivery is one of the important features of the device.

This is the first such contract let by the Navy for a fighter aircraft procedure trainer, according to Carmody. He says he has designed other trainers, a small number of which have been delivered to the USAF.

▶**Why a Trainer?**—Here is the philosophy behind the new synthetic procedure trainers:

They do not attempt to teach a pilot how to fly or navigate the plane. As Carmody, veteran Navy pilot himself, put it: "A pilot checking out on a supersonic job like the F9F-9 can be expected to know how to fly and how to navigate."

The devices are designed to teach a pilot those things that he cannot know about a new type of airplane: location of instruments, switches, control levers; what to do in case of any emergency such as engine flame-out, failures of the hydraulic, electrical or pneumatic systems; and ejection procedure.

Procedure trainers, like their more expensive and more elaborate cousins, flight simulators, use the cockpit and canopy configuration of the real airplane as supplied by the airframe manufacturer. All controls, switches, emergency handles and instruments are in the same locations as in the real plane.

▶**What It Does**—The new procedure trainer contains complete instrumentation, controls, switches and levers for:

- **Engine operation:** Starting, run-up, power check and shut-down.
- **Aircraft systems:** Hydraulic, electrical and vacuum.
- **Emergency warning:** Engine emergencies, including flame-out, engine fire, low fuel pressure; failure of any of the three aircraft systems; failure of the landing gear to extend. Any emergency or combination of emergencies can be "thrown into" the trainer by the instructor.

The trainer has a tell-tale system of lights which show the instructor if a student is performing all procedures correctly and in the proper sequence.

▶**Cutting the Cost**—Price of the procedure trainer is kept down by wide use of "dummy" instruments—the instrument face is in its proper place on the panel, but its expensive guts are not used. However the instruments may be controlled manually by the trainer instructor. For instance, if he should call on the trainer's automatic electronic mechanism to simulate a flame-out, the instructor can manually slow up the non-automatic airspeed indicator to lend realism to the emergency. None of the navigational and flight instruments is functional, all engine and system instruments are.

Another money-saver is that the trainer's flight controls are not operational. They do no more than add realism to the cockpit interior.

▶**Part of Team**—Carmody, who spent five years at Link Aviation, is a strong supporter of flight simulators, and does not see his procedure trainers as their competitor. He considers the two types complementary.

Here is his reasoning: The procedure trainers, because of their relative simplicity and ease of production, can be supplied to squadrons well ahead of delivery of new-model aircraft. This means that all pilots assigned to the new planes can familiarize themselves completely with the cockpit layout and all emergency procedures prior to actually seeing the aircraft.

Simulators, because of their inher-

ently more complex and complete design, cannot be delivered on such short notice, according to Carmody.

The trainers can also serve a useful and economical role after the flight simulators have been delivered. Instead of giving all pilot training in the simulators, which, Carmody says, are relatively expensive to maintain, the cockpit familiarization and emergency procedure portions of a pilot's syllabus can be retained in the trainers.

This would leave to the simulators their exclusive specialty of actual pilot training—teaching pilots the "feel," stalling and other flight characteristics of the plane, how to handle fuel management, how to fly navigational missions, etc.

Such a combined trainer/simulator program would allow more pilots to be trained with a given number of simulators, by diverting a portion of total training time to the trainers.

▶ **Advantages**—These are some of the advantages seen for the new procedure trainers:

• **Low cost** of the devices can save the taxpayer a lot of money. Trainers cost roughly 10% as much as a comparable simulator ($50,000 for a trainer vs. $500,000 for a simulator).

• **Simplicity** results not only in speedy delivery, but in easy and quick installation, low maintenance costs. Maintenance can be performed by a single person of relatively low skill.

• **Conventional power requirements** allow the device to be simply "plugged into the wall," since any 110-v., 60-cycle outlet will do. Momentary voltage fluctuations will not affect the unit; it uses no vacuum tubes.

• **Modifications** to adapt the trainers to later models of aircraft are relatively easy to make.

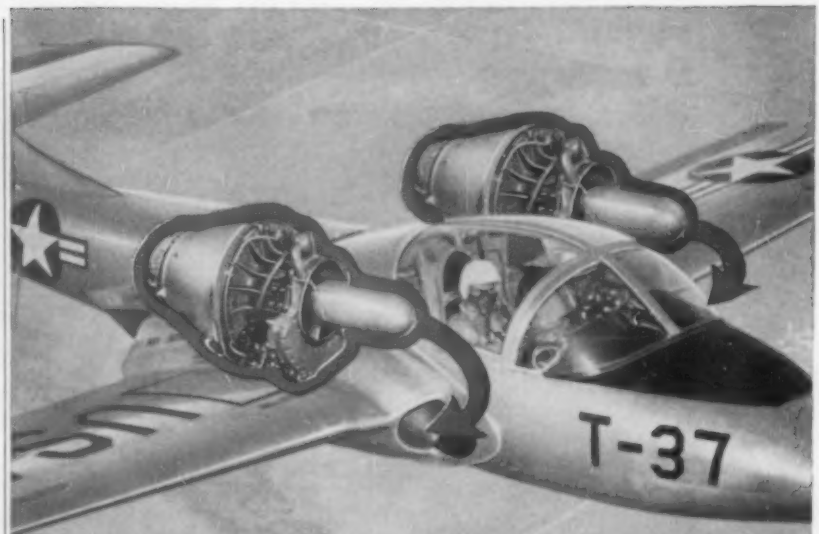
• **Housing requirements** are nominal. Any room of adequate size will do. No air conditioning is required.

▶ **Carmody Background**—Carmody's interest in "synthetic training" began in 1940, when he worked for Cal-Aero Academy where he taught Air Force pilots stunting techniques under contract to the government.

Prior to this assignment, he had put in time as a production worker at Northrop after graduation from the University of California at Los Angeles.

He then took Navy flight training at Pensacola. After getting his wings, he spent four years at sea as a carrier fighter pilot before the war.

After his trick with Cal-Aero, Carmody organized and headed the first flight section at BuAer's Special Devices unit, where he was in charge of developing training aids. He designed and developed the first synthetic Flight Training System and supervised training over 2,000 student pilots in the system which has now become standard



For High Performance, plus SAFETY . . . the Cessna T-37

SIDE-BY-SIDE JET TRAINER with SIDE-BY-SIDE C.A.E. POWER

It's engineered with tomorrow's needs in mind, this high-performance twin-jet Cessna T-37—designed to speed the cadet's transition from prop-driven airplanes to jets. It advances the jet phase to an earlier stage of the training schedule, promoting both safety and economy. Its Continental Model J69-T-9 jet turbines offer ruggedness and simplicity matching that of the airplane itself. Twin engines located in the wing roots make for maximum safety. A second version of this turbine powers the Ryan Q2 Firebee target drone used in aerial gunnery training, while still others are in experimental stages in various applications.

•

The C.A.E. family of gas turbines also includes the Model 220 fixed shaft turbine which powers the record-holding Sikorsky XH-39 helicopter; the Model 210 used in the L-19-C turboprop liaison plane, and the Model 140 air compressor. The latter is the heart of the MA-1 portable starter for large jets, which is built in its entirety by C.A.E., under Air Force contract.

CONTINENTAL AVIATION

OPPORTUNITIES UNLIMITED—
INVESTIGATE YOUR AIR FORCE RESERVE TODAY

CONTINENTAL AVIATION & ENGINEERING CORPORATION
12700 KERCHEVAL AVENUE, DETROIT 15, MICHIGAN
SUBSIDIARY OF CONTINENTAL MOTORS CORPORATION

Tomorrow's ideas are taking shape today

with BRIDGEPORT Aluminum Extrusions

Designing with the future in mind? Look to extruded aluminum shapes to cut costs and improve your products. And look to Bridgeport for the very latest in ideas and manufacturing techniques.

We can extrude standard or specially engineered shapes in all extrusion alloys—with properties to meet your specifications. Our research and development teams are ready *now* to help you design for tomorrow's competition.

Look ahead with Bridgeport for the best in aluminum extrusions... and the latest in forgings, too. Prompt service is as near as your phone.

Bridgeport

For the very latest in

BRIDGEPORT ALUMINUM

BRIDGEPORT BRASS COMPANY, ALUMINUM DIVISION, BRIDGEPORT 2, CONNECTICUT

Offices in Principal Cities

EXTRUSIONS FORGINGS

for all Naval student pilots, between 1942 and 1943. He acquired further experience in synthetic training during a five-year stint at Link Aviation where he held several positions, including that of director of education.

With this background in training devices, Carmody set up his own company in May 1954. He is confident that, with his procedure trainer now ready to go into production, a new "capsule trainer" he has developed to check out jet pilots in correct ejection procedure, and a third, yet-undisclosed device, he is on his way to entrenching his company firmly in the growing field of aeronautical synthetic training devices.

Jet Engine Igniter Guarantees Starts

A new British jet engine igniter incorporates an auxiliary fuel spray nozzle located only half an inch from the high energy igniter electrode to assure positive starts. Developer is K. L. G. Sparking Plugs, Ltd.

Before this igniter was developed, occasional "wet" starts were experienced because of failure of the fuel to ignite immediately upon injection into the combustion chamber, says K. L. G. The new igniter, whose auxiliary fuel jet atomizes the fuel spray, guarantees prompt fuel ignition by sending a ball of flame well down into the main fuel stream, the company claims. The new igniter is slightly larger than the unit it replaces.

Initial production of the all-in-one torch igniter is for the de Havilland Ghost engine, although the unit can be used with other gas turbine powerplants. It was developed for use with the Dowty Spill Burner fuel system.

K.L.G.'s address is Putney Vale, London S. W. 15, England.

Portable X-Ray Unit Goes Into Production

A self-powered X-ray machine which uses the radioactive isotope thulium 170 as its X-ray source has been put in production by Litton Industries' Nuclear Electronics division.

The portable, 20-lb. machine, named ISO-X, is well suited for inspection of metal castings, forgings and welds, according to the maker. Because of its small size, it is also useful to probe hard-to-get-at places in aircraft.

A built-in timer provides a means of setting precise exposures up to 60 sec. The unit's construction precludes the possibility of accidentally exposing the thulium, and it is explosion-proof and completely safe, requiring no special precautions, according to Litton.

XP6M-1, HSL Use New Viscous Damper

A new miniature viscous damper, measuring less than 3 in. in any dimension and weighing 9 oz. filled, is finding applications in modern aircraft such as the Martin XP6M-1 SeaMaster and Bell Aircraft's HSL helicopter.

▶ **Functions**—Built by Sesco Engineering Division of Haines Gauge Co., the unit performs these two functions:

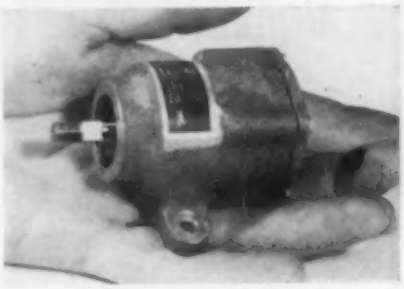
- **Prevents** unwanted vibration or hunting in a mechanical system;
- **Furnishes** a definite amount of damping to a system that is required to oscillate.

The damper, labeled Model 1025, has been developed "to furnish moderate amounts of angular rate damping in mechanical systems where small sizes and weight, and also minimum friction, are of primary importance."

On the Bell HSL, the Sesco dampers are used to prevent vibration in the copter's stabilizing system and damping out flutter in a yaw vane installation.

Application on the SeaMaster is not known.

▶ **Features**—Sesco cites these features for the viscous damper: The unit is precision-made of quality materials; shaft is mounted on ball bearings; housing is made of anodized aluminum alloy, and vane shaft is hardened stainless steel.



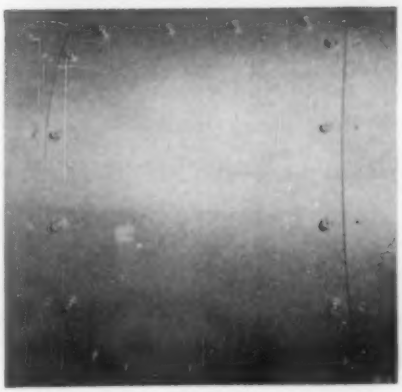
SIZE: Under 3 in. in any dimension.

The unit will operate in any position and is sealed against atmospheric effects.

Damping is adjustable over a wide range through use of a needle valve. Although no temperature compensation is provided, use of silicone damping fluid reduces temperature effects to a minimum.

Model 1025 specifications: damping rate, 0.5 to 25 in./lb./radian/sec. at 70F; friction torque, approximately 7 oz./in.; maximum permissible torque, 15 ft./lb.; weight of unit, 9 oz. (filled); temperature range, −60F to +160F; shaft rotation, 90 deg.; damping fluid, Dow-Corning #200 fluid, 100 centistokes (standard hydraulic oil may also be used).

Fasteners' New Job



Here is a new application of Camloc Fastener's stressed panel fastener unit (Aviation Week Sept. 13, p. 63) on a wingtip-type radar installation for a McDonnell F2H-3. Upper photo shows the radar pod on to the plane's wing tip. Lower picture gives closeup of the many SPF fasteners used to attach what appears to be an inspection door on the side of the radar housing. Avionic equipment contained in the pod is made by the Missile and Radar division, Raytheon Manufacturing Co., Bedford, Mass. This is first photo of wingtip radar installation on the F2H-3 Demon.

NAVIGATIONAL SYSTEMS DESIGN SPECIALISTS

If you are an experienced navigational systems design specialist capable of undertaking advanced Preliminary Design assignments, there is now an outstanding opportunity for you with the Northrop engineering team, which, since 1939, has pioneered in pilotless aircraft guidance technology. Requirements include experience in electronic and electro-mechanical systems design work and the ability to analyse complex servo-mechanisms.

Contact:

Engineering Personnel Manager

NORTHROP

AIRCRAFT INC.,

HAWTHORNE, CALIFORNIA

Phone: Oregon 8-9111 Ext. 1893

***Do you like* AVIATION WEEK..?**

Want to read it every week?

Subscribe today. Just fill in this order form and leave the rest to us.

To—AVIATION WEEK,
330 West 42nd St., N. Y. C. 36

Please send me AW for the term checked below:

☐ 1 yr. $6* ☐ 2 yrs. $9* ☐ 3 yrs. $12*
☐ Payment enclosed ☐ Bill me later
(*Rates quoted are for U. S. and Possessions only)

Name .....

Address Home ☐ Business ☐ .....

City..... Zone.... State.....

Company Name.....

Title or Position.....

NOTE: Subscriptions are solicited only from persons having a commercial or professional interest in aviation.

WHAT'S NEW

Telling the Market

Six-point jet engine service program developed by General Electric Co. to help users cut operating costs and get top performance from J47 and J73 powerplants is pictured in Bulletin GEA-6136. . . . Firm also offers Bulletin GEA-6203, telling about its **aircraft electric motors testing facility** at Ft. Wayne, Ind. Both are available from General Electric Co., Schenectady 5, N. Y.

Aircraft explosive rivet catalog provides technical data on numerous types, also examples of applications and hints on how to handle them. Write E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del. . . . **Airplane safety belts** are detailed in data sheet 422 being distributed by Brown-Line Corp., 341 No. Foothill Rd., Beverly Hills, Calif.

Aluminum Casting Alloys Handbook is 60-page two-color reference providing cross-index key to all important specs and provides descriptive material on metallurgy and casting practices. Write Federated Metals Division, American Smelting & Refining Co., 120 Broadway, New York 5.

Precision plating and surface treating facilities now being made available to outside firms by Standard Pressed Steel Co. at its new $1-million plating plant at Jenkintown, near Philadelphia, Pa., are detailed in 32-page booklet being made available by the firm. Data are also given on the process. Write for Precision Plating, a Product and a Service, Standard Pressed Steel Co., Box 566, Jenkintown, Pa.

Electrolizing, a process of depositing an extremely hard, dense alloy on wearing surfaces of mechanical parts, said to extend life two to 10 times, is covered in 16-pp. booklet available from Electrolizing Corp., 1505 E. End Ave., Chicago Heights, Ill. . . . **High velocity spray technique** of cleaning precision parts is described in folder being distributed by Cobehn, Inc., Passaic, Caldwell, N. J.

Metal slide rules, from simple basic equipment through standard scale arrangements to advanced dual-base log vector hyperbolic with log log range from 10^{-10} to 10^{10}, for numerous applications, are catalogued in 32-pp. booklet. Write Pickett & Eckel, Inc., 1109 S. Fremont Ave., Alhambra, Calif. . . . To aid engineers in selecting **platinum metals potentiometer winding alloy** wires for specific applications, a cross-reference chart PR plots bare diameter vs. resistance values. Available from Secon Metals Corp., 7 Intervale Ave., White Plains, N. Y.

Engineering properties and applications of **Ni-Resist corrosion-resistant nickel alloyed cast iron,** also tabulation of mechanical and physical properties, and problem data sheets, are provided in Bulletin A-71 available from International Nickel Co., Inc., New York 5, N. Y. . . . **New servo motors,** motor tachometers, synchros and a new line of special transformers for use with grid-controlled rectifiers, are detailed in Catalog 41 being distributed by Servo-Tek Products Co., Inc., 1086 Goffle Rd., Hawthorne, N. J.

Feed units, tapping units, hydraulic drill presses, index tables, fixed center and adjustable center drill heads are described in catalog available from Michigan Drill Head Co., P. O. Box 4643, Detroit 34. . . . Design and properties of **place bolts,** also applications, are given in brochure being distributed by Cleveland Cap Screw Co., 2917 E. 79th St., Cleveland 4, Ohio.

Light and compact **re-usable metal packaging** and storage containers, including custom models, are described in Technical Bulletin 601, available from Peters-Dalton, Inc., 17900 Ryan Rd., Detroit 12. . . . Selection and application of **five types of metal tubing** and properties of six glass-to-metal sealing alloys are covered in Bulletin 40, being distributed by Superior Tube Co., Norristown, Pa. . . . **Pioneer and Pacemaker** is a history of achievements of Firestone Tire & Rubber Co. from its founding in 1900 to the present. Write the firm at Akron 17, Ohio.

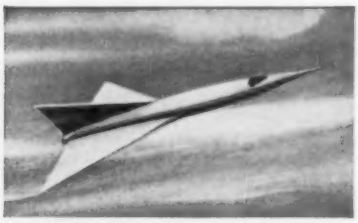
New adjustable speed drive having no rotating electrical components and able to provide constant or variable torque and constant horsepower loads, is described in Bulletin SF-1 available from Dynamatic Division, Eaton Manufacturing Co., Kenosha, Wis.

Non-ferrous forgings catalog and engineer's handbook covering more than 20 materials, including copper, copper-base and aluminum alloys, is being distributed by Scovill Manufacturing Co., Waterbury, Conn.

Guided tour of **sheet metal, acrylic forming and fabricating operations** of Kawneer Co.'s Aircraft Products Division is condensed in illustrated booklet being made available by the

experience

plays a vital role in every success



Pressure actuated switches for every requirement from zero absolute to 12,000 psi. Meletron switches are used by every major manufacturer of aircraft in the United States.

Human life and cargo are entrusted to the wind dried, capable hands of the harbor pilot. Experience taught him how to guide his ship around hidden sand bars and reefs; and experience has taught us how to build reliable pressure switches.

To build and test a few pressure switches is a relatively simple task. But to produce more than a million consistently reliable instruments requires skills and controls gained only through experience.

MELETRON® CORPORATION

950 NORTH HIGHLAND AVENUE, LOS ANGELES 38, CALIFORNIA

J. M. WALTHEW CO., Boeing Field, Seattle 8, Wash. THOMSON ENGINEERING SERVICE, 554 So. Summit St., Fort Worth 4, Texas and 307½ Laura St., Wichita, Kansas. ROUSSEAU CONTROLS Ltd., 2215 Beaconfield Ave., Montreal 28, Canada. JOSEPH C. SORAGHAN & ASSOCIATES, 1612 Eye St., Northwest, Washington 6, D. C.

FASTENER PROBLEM

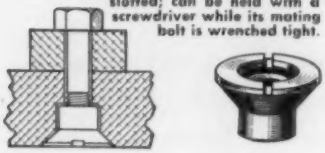
Grumman Aircraft's F9F-9 Tiger, one of few aircraft in the world capable of supersonic speed in level flight. Note "coke bottle" fuselage design.

Flush fastenings for aircraft skin sections with integral stiffeners

The new Grumman F9F-9 Tiger exemplifies the design trend toward thick skin sections with integral stiffeners. This type of structure greatly reduces the number of parts and the time and expense needed for conventional riveting of aluminum sheets over a framework.

However, basic aerodynamics required a nut which could be inset into the thick aluminum skin without protruding into the F9F-9's supersonic slipstream. Grumman engineers discovered a ready-made solution in the ESNA type 1650 flush 100° slotted nut with Nylon insert. Type 1650 nuts won't come loose, and are perfectly flush with the smooth surface of the two sections of the F9F-9's horizontal stabilizer which they hold together.

ESNA type 1650 flush 100° nut is slotted; can be held with a screwdriver while its mating bolt is wrenched tight.



Like all Elastic Stop nuts, the type 1650 is self-locking, vibration-proof and reusable. It meets ANA specification AN-N-5.

MAIL THE COUPON FOR DESIGN INFORMATION

ESNA

Elastic Stop Nut Corporation of America
Dept. N78-325, 2330 Vauxhall Road, Union, New Jersey

Please send me the following free fastener information:

☐ Details of type 1650 flush nut

☐ Here is a drawing of our product. What self-locking fastener would you suggest?

Name_____ Title_____

Firm_____

Street_____

City_____ Zone_____ State_____

Niles, Mich., company. . . . Kodascope Pageant **16-mm. sound and silent motion picture projectors** for training purposes, and improving employe and public relations, is described in leaflet available from Eastman Kodak Co., Dept. 2, Rochester 4, N. Y. . . . Advantages of area of lower Wabash Valley in southwest Indiana and southeast Illinois for establishing **aircraft manufacturing facilities** are described in a study being made available to interested firms by Chicago & Eastern Illinois R. R., Chicago.

Subcontracting facilities in electrical, electronic and mechanical equipment in the instrument and other fields, plus supporting services such as quality control, field service, technical publications and military packaging are given in brochure available from Avien, Inc., 58-15 Northern Boulevard, Woodside 77, N. Y. . . . **Facts About Air Reduction** details the numerous activities and equipment available from various divisions of the firm, which produces oxygen, acetylene and apparatus for welding and cutting in addition to synthetic resins and other products. Write Air Reduction Co., Inc., 60 E. 42d St., New York 17, N. Y.

Publications Received

• **All About Aircraft**—by D. M. Desoutter—Pub. by John de Graff, Inc., 64 West 23rd St., New York 10, N. Y. $5.00; 470 pp.

This book is designed to provide the layman with a summary of aeronautical information.

• **The World's Fighting Planes**—by William Green & Gerald Pollinger—Pub. by Hanover House, 575 Madison Avenue, New York 22, $3.50; 237 pp.

An up-to-date reference on the military planes of the world. It contains nearly five hundred photographs and three-view identification silhouettes of hundreds of types of combat aircraft.

• **Glass Reinforced Plastics**—Edited by Phillip Morgan, M. A.—Pub. by Philosophical Library, Inc., 15 East 40th St., N. Y., 16, N. Y. $10.00; 248 pp.

Purpose of this book is to compile essential facts on glass reinforced plastics for the general reader, but with sufficient detail for the specialist.

• **Airplanes of the World**—Drawings and descriptions by Douglas Rolfe—Historical introduction by Alexis Dawydoff—Pub. by Simon and Schuster, 630 Fifth Avenue, Rockefeller Center, New York 20. $2.95; 319 pp.

A record of the development of the airplane—from pusher to jet—1490 to 1954.

• **Limitation of Liabilities in International Air Law**—by H. Drion—Pub. by Martinus Nijihoff N. V., 9 Lange Voorhout, The Hague (Netherlands). Guilders 24.50 (Cloth)—Approx. $6.50 U. S. 389 pp.

This book deals with the problems arising in connection with limitation of liability under the Warsaw Convention of 1929 and under the two Rome Conventions of 1933 and 1952 on surface damage.

SCRAMBLE!... When time is scarce and speed vital . . . G-E motor-driven power units provide Air Force alert hangars with fast, reliable starting power. Shown is an F-86D Sabre, equipped with G-E J-47 jet engine.

HAMILTON AFB REPORTS . . . .

G-E Ground Power Units operate 2 years with "No electrical repairs required"

G-E motor-driven units provide reliable ground power in 325th Fighter Squadron alert hangars

During a scramble, speed depends on flawless performance by men and machines. For fast, reliable aircraft starts *absolutely essential* in an F-86D Sabre jet scramble, the 325th Fighter Squadron at Hamilton AFB, California, uses G-E Motor-driven ground power units. For over two years, they've used four G-E units for starting duty in their alert hangars, and in that time, "No electrical repairs have been required."

This is just one example of reliable performance G-E Ground Power Equipment is providing many Air Force alert hangars throughout the United States for both jet and reciprocating engines.

Power for instrument and device checking is also available with G-E 400-cycle Frequency Changer Packages. Motor-driven units in 265-, 500- and 1000-amp ratings, plus a-c and d-c generators for engine-driven or vehicle power units, fill out General Electric's complete line.

For further information, contact your nearest G-E Apparatus Sales Office, or write Section 814-1, DC Motor and Generator Dept., General Electric Co., Erie, Pa.

GENERAL ELECTRIC

1. JET ENGINE TROUBLE-SHOOTING. To help minimize aircraft "ground-time," G-E tech reps are available throughout the Free World to help personnel discover, correct unusual engine difficulties.

2. CLASSES IN THE FIELD. Using standardized manuals and visual aids, G-E reps often conduct classes designed to give students a better understanding of jet operating and maintenance procedures.

3. PARTS REPLACEMENT. Tech reps often help determine amount of parts needed to support flight operations, make available tools and test equipment for field use.

On more than 34,000 J47 turbojets delivered . . .

6-POINT G-E SERVICE PROGRAM HELPS CUT JET OPERATING COSTS

Over 250 G-E jet representatives at 100 locations in the U.S. and overseas help engine users get peak jet performance—anywhere, anytime

G.E.'s six-point jet service program is set up to help G-E engine users reduce their operating costs and get top performance from G-E J47 and J73 engines. Over the past four years, this program has helped reduce maintenance time-cycles. It has added extra operating life to G-E engines in the field. It has helped cut users' manpower needs. The program includes these major benefits:

WORLD-WIDE COVERAGE—In the U.S. and 13 foreign countries, the six technical services shown below are available at military bases, overhaul stations, spare parts depots, special test locations and G-E repair, overhaul and modification shops.

HIGHLY-SKILLED G-E TECH REPS, key members of the team, are on 24-hour call at bases here and abroad, in Stateside G-E service shops and through 65 G-E district offices. As part of G.E.'s complete technical services, Company representatives have a library of technical publications and training aids. They also can supply engine users with training films, visual aids, parts catalogs and handbooks for pilots.

PUBLICATION GEA-6136, "Operation Service," describes the six-point program in detail. For a copy, contact a G-E Aircraft Specialist via your nearest G-E Apparatus Sales Office. Or write *Section 232-4, General Electric Company, Schenectady 5, N. Y.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

4. G-E REPAIR, OVERHAUL AND MODIFICATION SHOPS provide complete maintenance service to customers. Shops are conveniently located to airframe manufacturers and USAF bases, thus help reduce users' costs.

5. ENGINE SERVICE ANALYSIS. Jet service reports gathered in the field are analyzed in IBM machines to give valuable information for parts replacement estimates, also for improvement of engine design for the Armed Forces.

6. ENGINE TRAINING SCHOOL. Advanced instruction in G-E engine operation and maintenance is given on request to military and civilian personnel at the Company's Cincinnati plant.

CHIEF PROJECT ENGINEER Harvey J. Brown (seated), Ryan Industries, Inc., Detroit, discusses new G-E motor for Ryan Industries' intervalometer-directed simulator with G-E Sales Engineer Hugh Folsom.

G.E. develops a versatile new aircraft motor to meet rigid specs of Ryan Industries, Inc.

"Recently we required an aircraft motor of extreme versatility to meet radio-interference, explosion-proof, and other military specifications on an intervalometer-directed simulator we were developing," says Chief Project Engineer Harvey J. Brown of Ryan Industries, Inc. "We took our problem to General Electric because of their proved ability to produce prototype and production models to meet our tight schedules."

"General Electric engineers developed a new motor which fully met our needs. And the close teamwork between our G-E sales engineer and his factory specialists enabled us to complete our development on time."

IN SERVING YOU, G-E engineers can draw on unmatched experience gained in solving this and hundreds of similar aircraft-motor problems. And they have at their disposal G.E.'s extensive aircraft-motor development and testing facilities.

To take full advantage of this extensive engineering service, contact your local G-E Apparatus Sales Office *early in your planning*. And for more information, write today to Section 704–31, General Electric Company, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

NEW AVIATION PRODUCTS

AIRPLANE TUG also starts engines.

Plane Tug Also Starts Jet, Piston Engines

A dual-purpose aircraft tug carrying a power supply for starting jet or piston engines has been tested at Portland (Ore.) Airport and is slated for further trials by Northwest Airlines at Seattle, Wash.

Built to Navy specs, the new vehicle can move aircraft of Convair B-36 size, the maker claims. It can pull or push aircraft, as desired.

Still in the experimental stage, the tractor has four-wheel drive and four-wheel steering and weighs 4,000 lb. The vehicle is 80-in. wide, 58-in. high and has a 101-in. wheelbase.

Wagner Tractor, Inc., 8027 N. E. Killingsworth, P. O. Box 7444, Portland 20, Ore.

New Fasteners Have Seal Under the Head

Sealing the head of a threaded fastener to the mating surface, rather than using the principle of sealing threads or shanks, is the design featured in a new line of fasteners.

Sealing is accomplished by a standard AN or MS "O" ring nestled in a specially designed groove under the head. The new item is available in common head sizes including countersunk.

A thin Teflon washer between the "O" ring and the head eliminates friction between seal ring and fastener, making the fastener reusable many times, the manufacturer claims. Oversize heads accommodate the "O"-ring groove. It is claimed that this feature makes for high tensile strength and greatly improved sealing capacity under shear.

Aero Bolt & Screw Co., Inglewood, Calif.

Porous Stainless Steel For Anti-Icing Systems

High-strength porous stainless steel sheet for hot-air anti-icing applications is now available to aircraft manufacturers from Aircraft Porous Media, Inc., N. Y.

The porous metal retains strength at temperatures exceeding 600 deg. F, the producer claims. The company states that the strength of the porous stainless steel permits "substantial" weight savings over aluminum double-skin in hot-air anti-icing systems. The appearance is similar to a polished aluminum surface. Sheets up to 18 in. x 72 in. are available.

The manufacturer also is a supplier of porous metal media and "Rigimesh" sintered woven wire materials for boundary layer control, filtration and transpiration cooling.

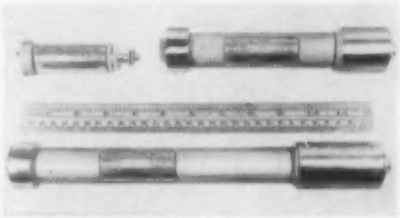
Aircraft Porous Media, Inc., 30 Sea Cliff Ave., Glen Cove, N. Y.

Missile Rate Gyro Weighs 0.8 lb.

Hermetically sealed rate gyro, weighing only 0.8 lb. has been placed in production for applications in guided missiles, control systems and autopilots.

The gyro develops an angular momentum of 400,000 gr. cm.^{2} per second. Units can be damped from 0.2 critical to overdamped through a temperature range of −55 deg. C to +80 deg. C without a heater. Rates and the output from a six-pole transducer can be varied over a wide range, the maker states. Power required is 26-v. or 115-v. at 400 cycles and either two-or-three-phase.

Instrument Division, R. C. Allen Business Machines, Inc., Grand Rapids, Mich.

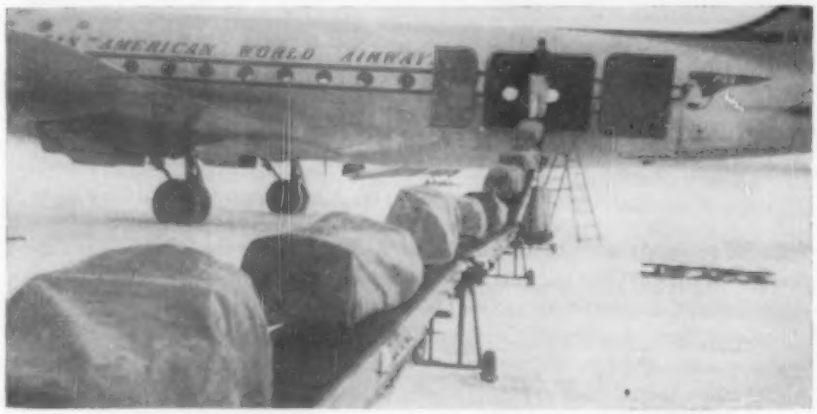


FAST RETRACTION takes up slack.

Auto-Operating Turnbuckle Gives 2¼-in. Adjustment

A new self-regulating turnbuckle with adjustment to 2¼-in. is applicable to aircraft operating in cold temperatures, the manufacturer states. When the required amount of compensation has been determined after test flights under extreme conditions in prototype aircraft, the proper size then can be specified for production planes.

The Bobrick Model J572 turnbuckle incorporates a quick-retraction feature for taking up slack. Each self-regulating device replaces the barrel of a



Conveyor Saves PAA $66 Monthly

This electrically-driven Rapistan roller conveyor system speeds up unloading cargo from Pan American World Airways' DC-4s at Fairbanks, Alaska. Cargo handling inside the aircraft is expedited by use of a gravity roller conveyor which turns cargo through 90 deg. at the plane's door. Speedy unloading is important because frigid temperatures as low as 40-50 deg. below zero can ruin perishables if they are exposed too long. The 105-ft.-long unit, which is made up of five standard 21-ft. Rapistan conveyor sections, moves cargo at 75 fpm. PAA says that, in addition to getting the job done faster than with fork lifts, the conveyor considerably reduces cargo damage and saves about $600 worth of manpower a month. Pan Am installed casters on one end of each conveyor section to increase mobility and raise sections near the aircraft to reduce angle of descent. System will work also with PAA's DC-6Bs.

AIRCRAFT ENGINEERS

Mail The Coupon Now!

"Let me tell you that opportunities here are as big as this plant—the largest in the free world—under one roof,"

says R. W. Middlewood, Chief Engineer

Without retracing a step, you can walk for 40 miles on the catwalks at this plant in Marietta, Georgia. Just another indication of the immense size of this aircraft plant, largest *under one roof* in the world.

Right now, Lockheed Georgians are building new B-47's, modifying earlier models, and manufacturing new C-130A turbo-prop assault transports. And because this plant is so big—76 acres of floor space under one roof—there is still room to build more big airplanes for the U. S. Air Force. Let me say that you can help, and *benefit!*

ENGINEERS NEEDED

DRAWINGS CHECKERS
STRUCTURES • STRESS
AERODYNAMICISTS
THERMODYNAMICISTS • DESIGN
SERVICE MANUALS • DYNAMICS
PRODUCTION DESIGN
RESEARCH • LIAISON
FLIGHT TEST ENGINEERS

Mail in complete confidence to:

Lockheed Aircraft Corporation, Dept. AW-3-28
761½ Peachtree St., N. E., Atlanta, Georgia

Name _____

Address _____

City _____ State _____

Job interested in _____

LOCKHEED
AIRCRAFT CORPORATION

Marietta, Georgia

conventional turnbuckle, reducing the installation's net weight.

Bobrick Manufacturing Corporation, 1839 Blake Avenue, Los Angeles 39, Calif.

Portable Power Supply Speeds Engine Checks

Variable d.c. power supply tests all 1 to 35-v. circuits, using a one-knob voltage output adjustment. Portable power supply can be operated without filtering if desired, the manufacturer states.

D.c. is fed through a reactor and condenser which removes most of the pulsations and provides d.c. voltage with less than one and one-half percent ripple. Isolation of input a.c. from d.c. allows operation of the latter above and below ground potentials. Surge suppression circuit prevents power supply damage on highly inductive loads.

In addition to 115-v., 50-60-cycle single-phase input, the unit also is available for 230-v., 50-60 cycle. Total weight is 95 lb.

Kell-Strom Tool Co., Inc., Wethersfield, Conn.

ALSO ON THE MARKET

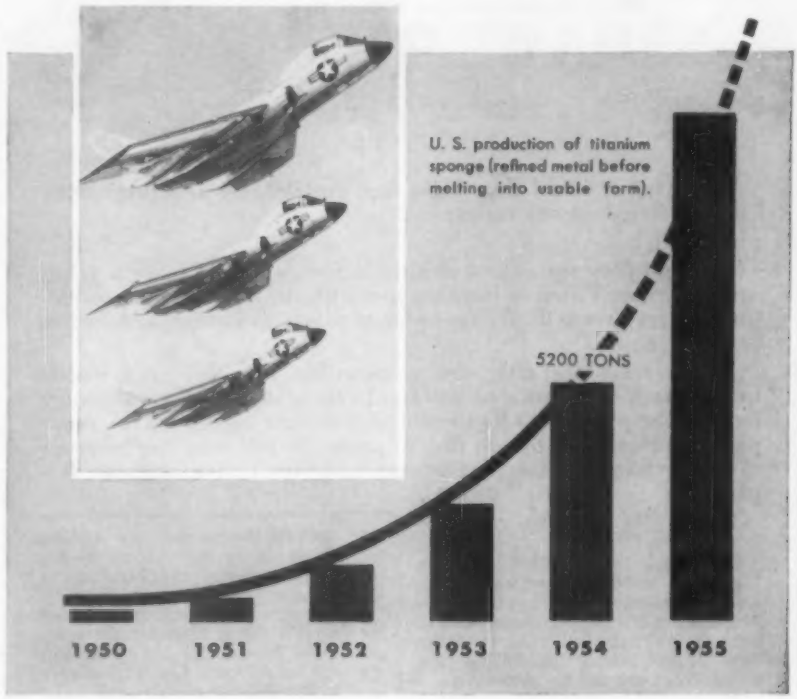
Bantam speed reducers, that the maker reports have no backlash for most purposes, are useful in flow controls, computers, timers and oscillographs. Two parallel gear trains are spring-loaded against each other, continuously taking up backlash. Torsion spring is wound to give an anti-backlash torque of 2 lb.-in. either direction. Obtainable in 600 standard ratios.—Metron Instrument Company, 432 Lincoln St., Denver 3, Colo.

Salt spray test chamber, useful for corrosion trials of radar and radio equipment, aircraft instruments, fire-control devices and finishes such as painting or plating, measures 48x48x48 in. inside. Salt solution reservoir is ample for 60-hr. operation. Recorder devices and other accessories are available.—Development Engineering Co., 9 Cross St., Norwalk, Conn.

Electrosize service offers new machining technique for precisely removing metal by a series of electrical discharges operating in a coolant bath of dielectric oil. Tool (electrode) is so constructed that the "cut" formed in the work by the discharges is a duplicate, in reverse, of the form on the tool. Tool does not touch the work.—Electrosize, Inc., 3910 Wesley Terrace, Schiller Park, Ill.

MALLORY·SHARON reports on

TITANIUM



SURPLUS in the midst of shortage?

● Despite the zooming curve of total titanium production, military planners set the *need* at 10 to 20 times today's availability. Yet, current demand for the new metal is temporarily short of current output.

This paradox results from the reluctance of major aircraft companies to design for *full usage* of titanium until they can be absolutely sure requirements can be met when new designs reach the production lines. Mallory-Sharon, one of the leading producers of today's output of titanium and titanium alloys, is attacking the situation in these ways:

- We are increasing production rapidly, and are now completing an expansion which doubles our capacity.
- Our "Method S" vacuum double melting, whereby each ingot is melted twice to improve uniformity, is becoming standard practice in the industry. More recent developments now in production are the first titanium alloys which can be welded and heat treated.
- As in the past, our delivery promises are conservative and dependable.

For applications of this lightweight, corrosion-resistant metal, use our experience. Mallory-Sharon Titanium Corporation, Niles, Ohio.

MALLORY Ti SHARON

(Advertisement)

Valve Talk

for WM. R. WHITTAKER CO., Ltd.

by Marvin Miles,
Senior Member, Aviation Writers Assn.

There's one word that flight line crew chiefs and inspectors know better than any other:

Squawk!

Not that they squawk — although there's bound to be a gripe or two now and then — but they live with the squawks of production testers and military acceptance pilots as formalized in the "squawk sheet."

These men not only are responsible for airplanes worth hundreds of thousands of dollars. In their skill can rest the very lives of the pilots who fly the ships. Yet their work, for the most part, is unsung, although they'll probably tell you they're used to being background performers and don't give a damn for plaudits.

The job's the thing. And writing off the squawks.

Take Dale Mackenstadt and Jim McDonald at North American, Inglewood, for example. Working for Frank Maple, flight line foreman, they've been crew chiefs on the line for more than fifteen years, shepherding new planes from roll-out to fly-away.

From the time an F-100 Super Sabre leaves final assembly today until it's officially delivered to the Air Force, it's their baby. Each, with his crew, works two or more planes simultaneously and it takes an average of two or three days before the fighters "go over the fence" to operational outfits.

On roll-out the crew chief and his men take the ship first to an assigned spot on the line where they "open up" the fighter and swarm over her in an exhaustive check procedure that includes everything from engine and flight controls down to placement of the seat cushion.

Then, when the crew chief is satisfied everything is in order, he calls up a flight line inspector such as Leonard Groppell who double-checks the work of the chief and his team.

Thus the jet is readied for her first flight with a production test pilot at the controls. He takes her up, puts her through prescribed maneuvers, studies her performance and that of her equipment and accessories.

And when he's again on the ground he fills out the squawk sheet on the basis of company standards. This needs adjusting. That needs working over. Something else requires this or that. It's rarely anything drastic, but largely the "sharpening" jobs that require expert fixers – the squawks that only flight can show up, but troubles that nevertheless might cause an emergency if allowed to go unattended.

From here on the pilot, the flight line foreman and the crew chief work together with the ground crew making corrections to the satisfaction of the line inspector and the production tester.

If the squawks are sufficiently serious the plane is flown again by the company pilot for another air check. But the need for a second hop is the exception rather than the rule and when the indicated fixes are made by the chief and his men the fighter is turned over to an Air Force acceptance pilot for final test.

Then the whole routine is repeated. The AF tester takes her up, guides her through her paces with a critical eye and lands to fill out another squawk sheet, usually with considerably fewer items this time. Each one is corrected in a joint effort with the crew chief and the foreman. And only when the job is done to the pilot's satisfaction, as well as to company specifications as checked by the line inspector, is the aircraft delivered as a safe and finished product.

In correcting malfunctions – the minor troubles that inevitably show up in the production of such an intricate weapon as the modern combat plane– the crew chief must know the airplane "inside out"and be able to make almost any repair necessary.

Of course he has specialists to help him, such as electronics experts, but it's still his responsibility to see that the job is done properly. And by the same token, the inspector must know the ship equally well to study and approve the work of the crew chief and his team.

It's an elimination system of check and double-check that refines an airplane to ultimate perfection, and it's the knowledge and skill and dedication of the crew chiefs and the inspectors — as well as the pilots — that achieves this perfection. Their remarkable records speak for themselves in every major plant.

AVIATION CALENDAR

Mar. 29-Apr. 1—American Society for Metals, ninth Western Metal Exposition and Congress, Pan Pacific Auditorium and Ambassador Hotel, Los Angeles.

Apr. 4-6—National Fluid Power Assn., second annual meeting, Broadmoor Hotel, Colorado Springs, Colo.

Apr. 5-7—Radio Technical Commission for Aeronautics, spring assembly and joint meeting with the Institute of Radio Engineers, Los Angeles.

Apr. 13-15—American Society of Lubrication Engineers, 10th annual meeting, Hotel Sherman, Chicago.

Apr. 14-15—American Ordnance Assn., symposium of Proving Ground Instrumentation Committee, Patrick AFB, Fla.

Apr. 16-20—American Association of Airport Executives, 1955 annual convention and business meeting, El Conquistador Hotel, Tucson, Ariz.

Apr. 18-21—Society of Automotive Engineers, Golden Anniversary Aeronautic Meeting, Aeronautic Production Forum and Aircraft Engineering Display, Hotel Statler and McAlpin Hotel, New York.

Apr. 18-21—American Society of Mechanical Engineers, Diamond Jubilee spring meeting, including four aviation sessions, Lord Baltimore Hotel, Baltimore.

Apr. 20-22—American Rocket Society, spring meeting, Baltmiore.

Apr. 27-29—Society for Experimental Stress Analysis, spring meeting, Hotel Statler, Los Angeles.

Apr. 27-30—American Helicopter Society, 11th annual formum, Hotel Mayflower, Washington, D. C.

Apr. 28-29—Michigan Aeronautical Conference, University of Michigan, Ann Arbor.

Apr. 29—Institute of Navigation, eastern regional meeting, Friendship Airport, Baltimore.

Apr. 29-30—New England radio-electronics meeting, sponsored by Boston and Connecticut Valley sections of IRE, Sheraton Plaza Hotel, Boston.

May 2-5—Society of Aeronautical Weight Engineers, national conference, Hilton Hotel, Ft. Worth.

May 3-5—Instrument Society of America, first national Flight Test Instrumentation Symposium, Allis Hotel, Wichita.

May 4-6—Fourth International Aviation Trade Show, 69th Regiment Armory, New York.

May 5-8—National Inter-Collegiate Flying Assn., annual convention and air meet, Meacham Field, Ft. Worth.

May 7-8—Association of Northeastern College Flying Clubs, annual inter-collegiate air meet, Troy (N. Y.) Municipal Airport.

May 9-11—National Conference on Aeronautical Electronics, Biltmore Hotel, Dayton.

May 16-20—National Materials Handling Exposition, produced by Clapp & Poliak, International Amphitheatre, Chicago.

May 23-24—American Society for Quality Control, ninth annual convention, Hotels Statler and New Yorker, New York.

May 30—Federation Aeronautique Internationale and KNVvL Royal Netherlands Aeroclub, fifth Internation Air Display, Ypenburg Aerodrome, The Hague.

YOUR GATEWAY TO WORLD TRADE

The Canadian International Trade Fair is the place to meet personally the men who can be most useful to you—and face to face is the best way to do business. This is the experience of businessmen who visit the Fair each year.

Here in Canada you have the greatest concentration of key men interested in buying and selling, ever assembled in North America. More than 25,000 businessmen—employers and employees—visited the Trade Fair in 1954. You should plan to come in 1955.

Address requests for information and accommodation to your nearest Canadian Government Trade Office, or The Administrator, Canadian International Trade Fair, Exhibition Park, Toronto, Canada.

8th Annual

CANADIAN International TRADE FAIR

TORONTO CANADA MAY 30th TO JUNE 10th 1955

YOUR GATEWAY TO WORLD TRADE

US-15M

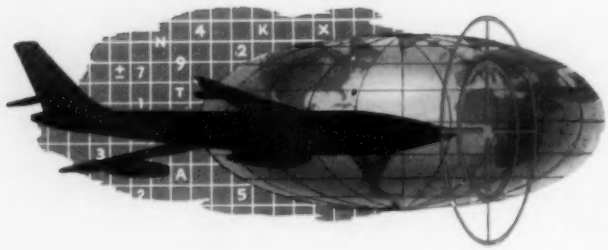
OPERATED BY THE GOVERNMENT OF CANADA TO PROMOTE YOUR BUSINESS

IBM news

TRADE MARK

FOR AVIATION ELECTRONIC ENGINEERS

EXCITING NEW CAREER OPPORTUNITIES ON DIGITAL COMPUTERS—including airborne types



Whether you're interested in airborne digital and analog computers for the military, or the powerful electronic giants for industry, government and education—IBM offers unparalleled opportunities for qualified electronic engineers!

Because of its large-scale programs in both of these vital and challenging fields, IBM has immediate need for qualified Electronic Engineers and Physicists to do advanced research, systems planning and design, plus both theoretical and experimental analysis on airborne digital and analog computers, transistorization, servo-mechanisms, and radar displays.

ALSO—excellent openings in IBM's manufacturing engineering organization in the design and development of electronic test equipment, functional testing and analysis, installation and maintenance of electronic test equipment, automation engineering, and manufacturing research.

Required: A degree in E.E. or Physics—or equivalent experience.

Desirable: Experience in any of the following fields: digital and analog computers, including airborne types, radar, TV, communications equipment, relay circuitry, automation, servo-mechanisms, instrumentation, or data handling systems.

"NEW IDEAS PAY OFF AT IBM,"

says George V. Hawkins, an IBM man since he was graduated from MIT in 1949.

"I know from personal experience how far you can go at IBM," says George. "In my six years, I've advanced from Technical Engineer on electronic circuit designs to Project Engineer in '52. And right now I'm in charge of new product planning at the Endicott laboratory.

"Things are really buzzing here at IBM, and an engineer couldn't ask for a better time to join us—or a better place to work!"

IBM OFFERS YOU A REALLY STABLE, SECURE, REWARDING FUTURE!

IBM's products are so diversified they serve all industries, as well as government and education. Markets are independent of seasonal fluctuations—war or peace.

Salaries are excellent, with advancement from within based on merit. IBM's employee turnover record is one of the very lowest in the country. Fine employee benefit program includes hospitalization, life insurance and retirement plans.

For information on these career opportunities

WRITE,

giving details of education and experience to:
William M. Hoyt, IBM, Dept. 3203
590 Madison Ave., New York 22, N. Y.

Your replies, of course, will be held in strictest confidence.

World's Leading Producer of Electronic Accounting Machines and Computers

INTERNATIONAL BUSINESS MACHINES CORPORATION

JOIN YOUR FRIENDS AT

IBM

THEY'LL TELL YOU IT'S A GREAT PLACE TO WORK.

GOOD ENGINEERS GO with GOODYEAR AIRCRAFT

Forceful, creative thinking by top-flight engineers is the key to Goodyear's progressive research and development programs.

Experienced engineers . . . men with ability and imagination . . . do top work for Goodyear. Positions are open to qualified physicists and electronic, electrical, and mechanical engineers for research, design, development, and product engineering in these fields:

Electro-mechanical	Pulse Techniques
Microwave	Weapons Systems
Servomechanisms	Antenna Design
Electronic Packaging	Miniaturization

Send a résumé of your qualifications or request application—

C. G. Jones, Salary Personnel Department

GOODYEAR AIRCRAFT CORPORATION

1210 Massillon Road Akron 15, Ohio

GOODYEAR AIRCRAFT

is YOUR FUTURE as promising as a HELICOPTER'S?

We think the future of the *helicopter* is virtually unlimited. Why not make your future just as promising?

SIKORSKY, pioneer helicopter manufacturer, needs . . .

TEST ENGINEERS
DESIGN ENGINEERS
DEVELOPMENT ENGINEERS

to do important work in the fascinating and fast-growing helicopter field. Expanding military and commercial requirements are a challenge to skilled men—offer excellent opportunities to further your professional stature.

Engineers whose abilities or experience qualify them for these responsible positions will enjoy a well-rewarded career with a secure future and many benefits for themselves and their families.

Send a complete resume to R. L. Auten, Personnel Department

SIKORSKY AIRCRAFT

Bridgeport 1, Connecticut

CALTECH

Southern California Cooperative Wind Tunnel

The Southern California Cooperative Wind Tunnel, owned jointly by five of the leading aircraft manufacturers and operated by the California Institute of Technology, has served the industry for ten years as a major test installation for the development of aircraft and missiles. This large, variable-density tunnel is now undergoing an $8,000,000 modernization program to provide the latest in facilities for testing at subsonic, transonic, and supersonic Mach numbers.

Openings are now available for:

TEST PROJECT AND AERODYNAMICS DEVELOPMENT ENGINEERS

These positions involve work on a wide variety of aerodynamic problems associated with transonic and supersonic wind tunnel design and operation, and with wind tunnel test programs and data analysis. Openings are available for recent graduates as well as for men with advanced degrees and/or experience.

COMPUTING ANALYSTS

Positions require B.S. or higher degree in mathematics for work in setting up and coding problems for solution using the new ElectroData high-speed digital computer.

For additional information please contact the Personnel Office.

CALIFORNIA INSTITUTE OF TECHNOLOGY
Pasadena, California

YOUR CALLING CARD FOR A BRILLIANT FUTURE . . .

Bendix Missile Section is a major contractor in the U. S. Navy's guided missile program--a part of the "new look" in our defense plan. Our expanding program has many opportunities for senior engineering personnel: Electronics Engineers, Dynamicists, Servo-Analysts, Stress Analysts, Project Coordinators, and Designers. Take time now to look into the opportunities which Bendix can offer you. Write Employment Dept. M, 401 Bendix Drive, South Bend, Indiana.

DIRECTOR OF SUPPLY

This responsible and challenging position with an overseas based airline, which is heavily engaged in contract maintenance and overhaul for the U. S. Air Force, is open to a top-notch man with experience in aviation supply administration. A thorough understanding of an experience in the aviation industry is essential in order to direct and control stock, property, storage, issue, as well as procurement. Overseas residence required.

All replies confidential.

Send Resume To:
P-5791, Aviation Week
330 W. 42 St., New York 36, N. Y.

AIRCRAFT RADIO TECHNICIAN

Require 2nd class radio-telephone license. Ability to install and repair radio systems, autopilots and electronic equipment. Distributors for Bendix, ARC, Lear, Narco.

ATLANTIC AVIATION CORPORATION
Logan Airport, East Boston, Mass.

RCA

ANNOUNCES THE OPENING OF A NEW SYSTEMS ENGINEERING CENTER IN THE

BOSTON AREA

NOW, RCA expands the Systems Development phase of its Airborne Fire Control program! Its new Systems Engineering Center in the Boston area becomes headquarters for RCA's *advanced* Fire Control Engineering.

High-level planning and advanced development will center on fire control systems for tomorrow's supersonic interceptors. These systems will grow out of RCA's experience in the development of successful systems now in use.

IMMEDIATE OPPORTUNITIES . . . YOU MAY QUALIFY

Professional **ability** to create and analyze overall complex systems and **experience** in Systems Engineering required. RCA advantages include: planned professional and financial advancement; modern benefits for you and your family; liberal tuition refunds for advanced study.

PERSONAL INTERVIEW WITH RCA ENGINEERING MANAGEMENT ARRANGED IN YOUR CITY

Please send a resume of your education and experience to:

Mr. John R. Weld
Employment Manager, Dept. B-2C
Radio Corporation of America
30 Rockefeller Plaza, New York 20, N. Y.

RADIO CORPORATION OF AMERICA
ENGINEERING PRODUCTS DIVISION

Creative Engineering Opportunities with Republic

Aerodynamics

Aerodynamicist
An aerodynamics engineer (3-4 years experience) experienced in analysis of aerodynamic data and stability problems. To investigate stability and control problems under supervision. Extremely interesting work in advanced problems.

Aerodynamicist
Man with ability to combine theoretical and practical aerodynamic to determine aerodynamic load distributions and to work in the field of aeroelastic analysis. A background knowledge of compressible and incompressible flow of perfect fluids and an understanding of basic engineering mathematics is desirable. This position offers an exceptional opportunity for professional development in fundamental aerodynamic analysis.

Dynamics

Dynamics Engineer
A broad program involving analytical and experimental investigations of the complex dynamics problems associated with supersonic aircraft offers a real opportunity for young engineers with ability. You will gain invaluable experience under competent supervision to develop a professional background in such areas as servomechanisms, analogue computers, control system dynamics, non-linear mechanics and hydraulic system analysis. A program of laboratory investigations on actual systems in conjunction with analytical work, as well as a coordinated lecture program, offers an outstanding environment for rapid professional development. A degree in ME, AE or Physics with good Math background is preferred.

Flight Test

Aerodynamicist
For Flight Test Engineer position. Aero education and experience with stability required. To work on planning and analysis of high speed experimental flight programs.

Stress Section

Senior Stress Analyst
Engineering degree with a minimum of 3 to 5 years stress analysis and design experience on major airframe components.

Research

Electronic Instrumentation Engineer
Three to five years aircraft instrumentation experience required. Knowledge of transducers, amplifiers and recording equipment used in experimental research testing of hi-speed jet aircraft is essential. Knowledge of servo loop theory as applied to aircraft systems coupled with ability to properly instrument, record and analyze is desirable. Graduate with E.E. degree preferred.

Research Engineer—Hydraulic Controls
B.S. degree in mechanical or aeronautical engineering with experience on aircraft hydraulic systems. Work involves mechanical and hydraulic problems such as control system frequency response, hydraulic system and control valve characteristics and high temperature fluids, packings, pumps and related components. Must be capable of planning and conducting test programs, designing special test equipment, maintaining contact with vendors and design personnel.

Electronics Engineer
Familiar with airborne electronic equipment (communications, navigation I.F.F., Radar and Autopilots), preferably with 2 to 4 years aircraft experience. Should be a college graduate. Duties will include system investigations, establishing test procedures and conducting environmental tests on airborne electronic equipment and components.

Thermodynamics

Specialized openings for Thermodynamics engineers in the following categories. B.S. in M.E. or A.E. required.
Thermodynamics Engineers
(1) Two years experience in high speed gas flow.
(2) Two years experience in heat transfer.

Flutter & Vibration

Senior Dynamics Engineer
Position open for a qualified engineer to work on flutter problems of supersonic aircraft and direct work of other engineers. Opportunity to work on the most advanced high performance aircraft which will challenge the ingenuity of the man who takes this job. Several years experience in flutter analysis required. Chance for advancement good.

Please address complete resume, outlining details of your technical background, to:

Mr. R. L. Bortner
Administrative Engineer

REPUBLIC AVIATION
FARMINGDALE, LONG ISLAND, NEW YORK

HOSE ENGINEERS

Well established firm has rapidly expanding hose division. Project engineers are needed.

Exceptional opportunity for experienced men with proper educational background.

Send full details . . . your confidence will be respected.

P-5927, Aviation Week
520 N. Michigan Avenue,
Chicago, Illinois

HYDRAULIC SERVO DESIGN ENGINEER

For design and development of airborne electro-hydraulic servos and manually controlled boost servos. Includes work on manual and electro-hydraulic transfer valves, rams, control linkage and regulators.

Minimum 4 years experience in detail design and development of aircraft hydraulic servo control components and systems. Emphasis on size, weight, and fail safe techniques. Familiarity with shop practice and ability to design for production a necessity. Knowledge of servo theory desirable.

Interview appointment at company expense with qualified applicants. Send resume to:

Employment Manager

LEAR, Inc.
110 Ionia Ave., N.W.
Grand Rapids 2, Mich.

FLIGHT ENGINEERS

Immediate openings for Flight Engineers desiring international flight career (New York Base) with

PAN AMERICAN WORLD AIRWAYS

Beginning salary $5670. Employee benefits include retirement & life insurance plans, 30-day vacations per year, discount travel, etc. Applicants must be U. S. citizens, maximum age thru 31 years, H.S. grads, college engineers preferred, exempt from military service, able to pass flight physical, height 5'6" to 6'4".
Must have A&E Licenses, OR have completed Secs 1 thru 7 of CAA Flight Engineer Exam.
Contact your nearest employment office:
28-19 Bridge Plaza No., L.I.C., N.Y., ST 6-5858
Int'l Airport, Miami, Fla., Tel 64-5411
Int'l Airport, So. San Francisco, Cal., PL 5-7000

LIVE AND WORK IN COLORADO SPRINGS:

We have immediate openings for following positions:

METALLURGIST
DESIGN ENGINEERS
STRESS ANALYST
INSPECTORS

Design engineers with experience in military aircraft seat design preferred.
Send resume, indicating salary requirements, to
personnel mgr. P. O. Box 77
AIRCRAFT MECHANICS, INC.
Colorado Springs, Colo.

ENGINEERS

LONG-RANGE, CONTINUING OPPORTUNITY FOR ELECTRICAL AND MECHANICAL

ENGINEERS

AT

Bendix

OPENINGS EXIST FOR—

COMPUTER ENGINEER

Requiring an engineering degree in electrical engineering or math and physics, plus a minimum of three years of computer activity. To handle programming in the simulation and study of jet and reciprocating engine fuel systems. problems involved would be linear and non-linear in nature and applied to product design as well as research into basic phenomena. No maintenance ability necessary.

MAGNETIC AMPLIFIER SYSTEMS ENGINEER

Electrical engineer supervisory capacity on research and development of magnetic amplifier circuitry, control systems, and component design and testing, supervising other engineers and technicians.

LIQUID PROPELLANT ROCKET CONTROLS ENGINEER

Mechanical or electrical engineer to supervise the research and development of liquid propellant rocket controls, systems design, component design, development, and testing.

The salary of these positions will be determined by your ability and experience.

Send detailed resume listing education, engineering experience, and salary requirements to:

Technical Employment Department
Box 255-AW
Bendix Products Division of
Bendix Aviation Corporation
401 North Bendix Drive
South Bend 20, Indiana

We guarantee you an immediate reply

the doors are *Open*

for 75 ENGINEERS

- Airframes
- Stress & Weights
- Materials & Laboratory
- Power Plant Design
- Power Plant Operation
- Hydraulics & Controls
- Electrical, Radio & Instrument
- Liaison

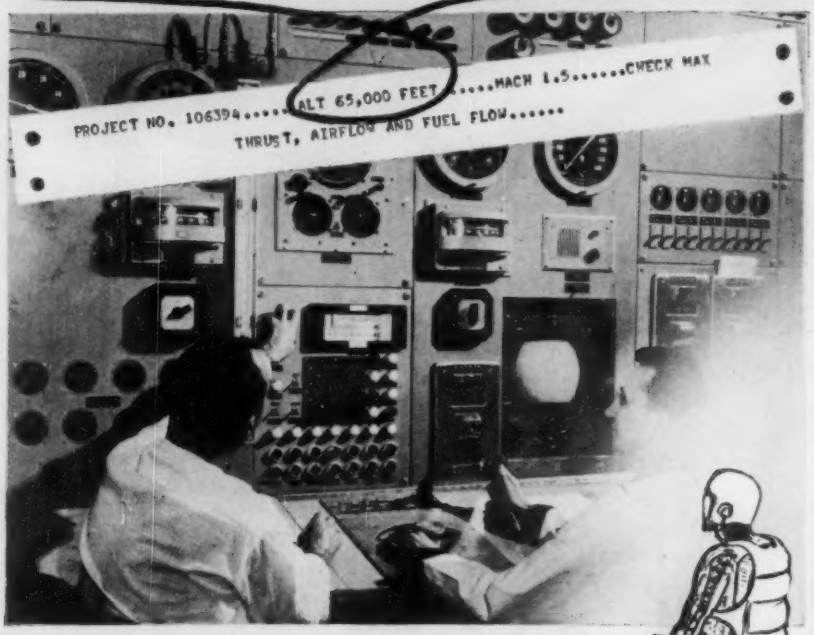
IF you want immediate employment in an area where new horizons are opening in aviation, including latest developments in in-flight refueling—IF you want to live in the Sunny South—IF you have experience in aircraft for any of the positions listed above, send a resume of your qualifications to:

MR. A. V. WELSH
Employment Manager
P. O. Box 2287

Hayes
AIRCRAFT CORPORATION
Birmingham, Ala.

FLIGHT TEST ASSIGNMENT.....

ALT 65,000 FEET.....MACH 1.5..



Jet Engine Test Cell's Control Console

Less than 20 feet away . . . outside the control blockhouse . . . the turbojet is locked in the test cell. Technicians adjust the flow and character of the air; watch the TV monitor. The jet is "on station" . . . operating under simulated high altitude, supersonic flight conditions. Hundreds of pressure, mechanical and temperature measurements are made; the data clicks into automatic computors for final reduction, and the controls are set for the next "test point."

The test cells and wind tunnels of the Air Force's Arnold Engineering Development Center may not completely replace the experimental test pilot . . . but they provide a rapid, precise, economical means to speed the development testing of aircraft, guided missiles and propulsion units.

ARO, Inc., operating contractor for the Center, has a variety of interesting assignments for Aeronautical, Mechanical and Electrical Engineers, Mathematicians and Physicists. Write Lee C. Kelley, Jr., Box 162, Tullahoma, Tennessee.

ARO, INC.
TULLAHOMA, TENNESSEE

VICKERS INC.

Leader in oil hydraulics is expanding its Aircraft Sales and Service Division. Applications are now being accepted for:

TECHNICAL SALES ENGINEERS

Prefer applicants with proven sales ability with a degree in electrical or mechanical engineering. Some experience, in Missile Controls, Jet Engine Controls, Constant Speed Drives, Servomechanisms and valves or Aircraft Hydraulic Systems and Controls would be desirable. We also invite inquiry from recent graduates interested in training for hydraulic sales.

FIELD SERVICE ENGINEERS

Prefer applicants with mechanical or electrical engineering degree for field service work relating to aircraft hydraulic units. Must have practical background in oil hydraulics with some electronic experience desirable. From 3 to 6 months will be spent in training after which extensive travel will be required. Prefer applicants 26-35 years of age who would be free to relocate in another geographic area at some future date.

Forward resume including education, experience, and personal qualifications to

SALARIED PERSONNEL DEPARTMENT
VICKERS INC.
1400 Oakman Blvd. Detroit 32, Mich.

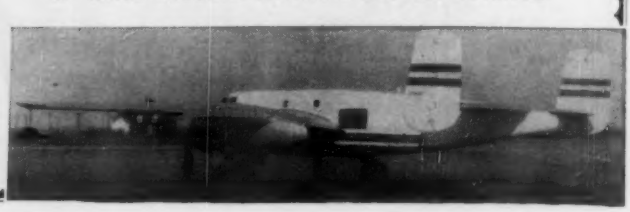
CAA APPROVED REPAIR STATION—
AIRCRAFT, RADIO AND INSTRUMENTS

Dealers for Lear, Collins & Bendix Radio and Eclipse-Pioneer Instruments

SOUTHERN CALIFORNIA AIRCRAFT CORPORATION
Ontario International Airport
Ontario California

PBY-5A AND LUXURY TYPE "LANDSEAIRE"
CESSNA AIRCRAFT DEALER

- Specializing in PBY-5A—C-47—DC-3—B-25——Lodestar—Beechcraft
- Fully equipped to do Maintenance and Overhaul on all types of Aircraft
- Ultra Modern Interiors and Conversions



UNITED AIR LINES needs pilots and flight engineers NOW!

New age limits!

Wonderful career opportunities with the nation's number one airline now open to qualified men. Company benefits include excellent pay, broad insurance program, retirement income plan and others.

Qualifications: Height 5'-7" to 6'-4". U. S. citizen, high school graduate, commercial pilot license, pass physical with no waivers. Age 21-28.

Applicants who, in addition to above qualifications also have Instrument Rating or Flight Engineer's Certificate (or Flight Engineer's examination written portion passed) will be accepted through age 29; with both Instrument Rating and Flight Engineer's Certificate through age 30.

Successful applicants will attend United's Flight Training Center at Denver and receive salary while in training.

Write: C. M. Urbach
Placement Superintendent
United Air Lines
Stapleton Airfield
Denver, Colorado

INSTRUMENTS AND ACCESSORIES

SALE • OVERHAUL • EMERGENCY REPLACEMENT

Instrument Associates offers you the services of their CAA approved laboratories for fast overhaul, modification and sales of aviation instruments. Whether one instrument or thousands, our production line facilities for the overhaul of instruments results in a savings of both time and money. If your instrument needs are electronic, gyroscopic or pressure, Instrument Associates can serve you.

Distributors for

KOLLSMAN • U. S. GAUGE • EXIDE AIRCRAFT BATTERIES
• WESTON AIRCRAFT INSTRUMENTS

Authorized Sales and Service for

SCHWIEN ENGINEERING CO. • ECLIPSE—PIONEER
• GUTHRIE PRESSURE SWITCHES

CONTRACTORS TO U.S.A.F.—U.S.N.—DOMINION OF CANADA

C.A.A. APPROVED REPAIR STATION #3564
INSTRUMENTS CLASS 1, 2, 3, 4 AND LIMITED ACCESSORIES

•

Our stock of instruments and accessories is one of the largest in the East.

•

Complete Stock of Sperry, Jack & Heintz and Eclipse Pioneer instrument parts

•

Foreign Inquiries Get Special Attention from Our Export Department

•

IMMEDIATE DELIVERY

INSTRUMENT ASSOCIATES

351 GREAT NECK ROAD • **GREAT NECK, N. Y.**

Telephone: HUnter 2-9300 • **Telegraph: Wux Great Neck, N. Y.**

Cable: AIREXO, Great Neck, N. Y. **U. S. Export License 2140**

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)
LOS ANGELES: 1111 Wilshire Blvd. (17)

POSITION WANTED

ATTORNEY, NAVAL jet aviator. Presently legal counsel for prime aviation manufacturing company concentrating on government contracts, industrial relations and insurance and tax structure of company. Desire more challenging legal post in airline or aircraft manufacturing activity. PW-5885, Aviation Week.

EXECUTIVE PILOT or Co-Pilot with a future. ATR, current DC-3, D185, over 4,000 hrs., 4 years executive flying experience. A&E, Aero-Engineering degree, age 32, resume on request. PW-5966, Aviation Week.

FOR SALE

Inflatable Life Rafts, one to 20 man. Survival equipment. Descriptive price list upon request. Karl Ort, Dept. AW, York, Pa.

Lockheed Lodestar 18-56 Serial No. 2339. Flush riveted, Wright Cyclones G2-5A's, Total Time 5,756, Time since o'haul 359. Excellent for executive conversion. For Sale by Owner. FS-5925, Aviation Week.

AIRPLANES WANTED

Need 50 Bonanzas, Navions, 180's, 190's, 170's, Aero Commanders, Twin Navions, Twin Beeches, etc.
Will Buy Dealers' Stocks New or Used
Vest Aircraft Co.'s Skyranch
BOX 5306, DENVER 17, COLORADO

WANTED - 3D40

Hubs, Propellers and Parts
Also Other Propellers.
PACIFIC PROPELLER CO.
P. O. Box 6133, Riv. Hgts. Br. - LAnder 1431
SEATTLE 68, WASHINGTON

SUPER-92

over 200 mph for your DC-3
CAA Approved—better single engine—lower costs
Fully interchangeable with —92
ENGINE WORKS
Lambert Field Inc. St. Louis, Mo.

SPECIALISTS in Custom Radio Installations

DISTRIBUTORS FOR

SPERRY
BENDIX-COLLINS
LEAR - ARC
FLITE-TRONICS

- Airborne Engine Analyzers
- Communication Systems
- A-12 Autopilots w/auto approach
- Navigation Systems
- Distance Measuring Equipment
- Integrated Flight Systems
- Custom Edge-lighted Control Panels
- RDR-1 Airborne Radar*

* First Lodestar completed photographs & engineering data available on request.

Your inquiries and inspection are invited

Complete Systems in Stock

Page AIRWAYS inc.

Rochester Airport
Rochester, N. Y.
Genesee 7301

Alleghany Cty. Airport
Pittsburgh, Pa.
Homestead 1-4044

DOUGLAS C-54-B

• • • CASH SALE ONLY • • •

DIRECT BY OWNER

Approx. 1500 hrs. on Airframe since O.H.
P & W R2000-7M2 Engines—Low Time
Complete Airline Radio and Instruments
75 Hi-Density Seats
Cargo Door—Heavy Floor

Write, Wire, or phone

— BEST OFFER —

LOS ANGELES AIR SERVICE, INC.

Municipal Airport — Hawthorne, Calif.

OSborne 6-0411

NOTICE

• FOR SALE •

— BEECHCRAFT —

We have added another Lockheed Lodestar to our Fleet and are offering for sale the last D-18-S twin Beech of our Fleet. S/N A-6, purchased new in December of 1945. It has a lot of time, but is in top shape, well equipped and has been maintained for continuous Executive use. We have lots of "spares" available from our own stock.

Make Offer To:—

Air Transport Department
CONTINENTAL CAN COMPANY, INC.
BOX #791, MORRISTOWN AIRPORT
MORRISTOWN NEW JERSEY

SPECIAL SERVICES TO THE AVIATION INDUSTRY

PROPELLER SERVICE

RAS INCORPORATED

PROPELLER OVERHAUL

Pick up and delivery in New York area. Finest equipment. Experienced personnel. Approved repair station for Hamilton Standard and Hartzell propellers.

READING AVIATION SERVICE, INC.
MUNICIPAL AIRPORT READING, PA.

PARTS & SUPPLIES

—AN— AIRCRAFT RIVETS

IN STOCK READY TO SHIP—
NEW MATERIAL—NO SURPLUS

JOHN E. COOLIDGE COMPANY
2508 W. SLAUSON — LOS ANGELES 43

NAVCO INC.
Lambert Field
St. Louis, Mo.
TErryhill 5-1511

Has all Parts and Supplies for Executive
DC-3 LODESTER BEECH

Airframe Engines Radios
A.R.C. Bendix Collins Lear Sperry Wilcox
P&W Continental Wright Goodrich Goodyear

AIRCRAFT DEALERS

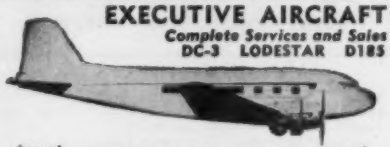
WE SELL

BUY • LEASE • TRADE • FINANCE
MULTI-ENGINE AIRCRAFT

WE OWN THE AIRCRAFT WE OFFER

Wire or Write
L. B. Smith
AIRCRAFT CORPORATION
DEPT. AW-3 • P.O.BOX 456, MIAMI 48, FLA.

EXECUTIVE AIRCRAFT
Complete Services and Sales
DC-3 LODESTAR D18S



Inc. of ST. LOUIS REMMERT-WERNER Inc. of TOLEDO

EXECUTIVE TRANSPORT AIRCRAFT
All Models
BEECHCRAFT LOCKHEED
CONVAIR GRUMMAN
DOUGLAS CESSNA
AERO COMMANDER
WELSCH AVIATION CO.
50 East 42nd Street, Suite 729
New York 17, New York Murray Hill 7-5884

PERSONAL and EXECUTIVE AIRCRAFT
Buy — Sell — Trade — Finance
INQUIRE FOR FREE LIST
GRAUBART AVIATION
679 N. Michigan, Chicago, MOhawk 4-7190
"WE OWN THE AIRCRAFT WE SELL"

OVERHAUL & MAINTENANCE

REMMERT — WERNER, Inc.
Lambert Field St. Louis, Mo.
offers your choice of

1 DAY	2 DAY	3 DAY
100 hour INSPECTIONS	or	100 hour OVERHAULS

for

BEECHCRAFT DC-3 LODESTAR

DEAL DIRECTLY WITH OWNER

Frederick B. Ayer
offers
4 NEW P & W 985-14B ENGINES

Available immediate delivery in their present condition *$4500 each.*
Or,—after complete factory overhaul by Pratt & Whitney. FOB Hartford *$6000 each.*

Dealers protected and discount for quantity purchase.

Since these engines can not be replaced, offering must be subject to prior sale.

Frederick B. Ayer
TRADE-AYER COMPANY
Linden Airport, Linden, N. J.
Linden 3-7690

TWIN BEECHCRAFT

1,000-hr. insp. new license, new Zero-Time, P&W 985 engines, 19 carbs. Overhead inst. panel. Cockpit and cabin soundproofed, 5-seat cabin configuration, drag line strut modification, new slide tubes, main gear, new tail wheel assembly, ARC-Omni, ARC-VHF rec., Bendix ADF 3 ARC VHF T-11B trans. 1 RCA VHF trans., marker beacon, cabin amplifier. Ship painted blue with red stripe.

ROLLINS & ASSOCIATES
Rehoboth, Delaware Phone 3261

FOR SALE

Airport HANGARS

In Good condition, purchase standing.

One 80' x 100' x 14'....asking $6,000.

Two 80' x 100' x 20'....asking $11,000

Bolted angle iron structure, galvanized steel sidings, sliding doors on both ends.

write or wire

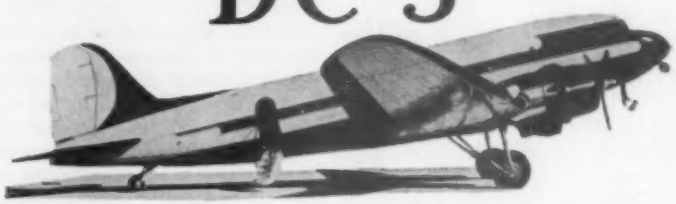
C. L. McMAHON, Inc. 1605 NBT Bldg. TULSA, OKLA.

SURPLUS NEW EQUIPMENT

84 Wing Covers for P.V.—1 (Pauline)
372 Lord MR-37 Mounts.
62 Oxygen Masks Number OH-312-4004-A
All perfect condition. Make offer, all or part.

Budd Manufacturing Corp.
242 W. 56 St. New York 19, N. Y.
Phone: Circle 7-0045

Executive DC-3



- AIRFRAME COMPLETELY OVERHAULED ZERO TIME
- ENGINES "NEW" WRIGHT 1820-56-1350 H.P. OR P & W 1830-92
- PICTURE WINDOWS, "NEW" BUBBLE TYPE
- COLLINS OMNI. FULL RADIO
- ANTI-ICERS — DEICERS
- JANITROL HEATERS

Leeward AERONAUTICAL

P. O. BOX 210 FORT WAYNE, INDIANA

P. O. BOX 233 INTERNATIONAL AIRPORT MIAMI 48, FLORIDA

ENGINE WORKS

Lambert Field, St. Louis, Missouri

Largest suppliers of engines for executive DC3. We stock, overhaul, and install—

R1820 —202A —56 —56WA —72 —72WA

R1830 —Super-92 —75 —92 —94

R2000-D5, -13 R1340 R985

DC-3 Owners—Write for our DC3 engine evaluation form, and engine exchange plan.

FOR SALE

LUXURIOUS LOCKHEED PV-1

Beautiful 9-Place Interior

Typewriter Desk — Bed-type Divan
4 Recl. Chairs — Bleached Walnut Woodwork
1 Swivel Chair — Cabin Radio
Equipped Galley — Intercom Phone

Completely Painted Exterior

Airline radio, heavy PV-2 gear, autopilot, rotating beacon, bullet-proof tanks, $30,000 spare parts. 2500 hrs. since new. R. eng. 0 hrs. SO. L. eng. 150 hrs. SO. Ship has been excellently maintained.

Exclusive Agents

ATLANTIC AVIATION SERVICE, Inc.

P. O. Box 1709 Wilmington, Delaware

HILLER HELICOPTER

Model UH 12A with Agricultural Spray equipment, full canopy, dual controls, 2-way radio.

In excellent condition

East Coast Aviation Corporation

Bedford Airport Lexington, Mass.

---

what? no NEW plane in your *Future*?

If you've outgrown your present planes or need to expand your fleet, you can find the answer to all your aircraft problems at L. B. Smith Aircraft Corporation where a varied selection of business planes of tomorrow invite your inspection today at our new and expanded facility in Hangar No. 2, 20th Street side.

DC 3's	Douglas A20G
Lodestars	Convair 240
Lockheed Executive PU-1	Martin 202

BUY • SELL • LEASE OR TRADE

WIRE OR WRITE

L. B. Smith

AIRCRAFT CORPORATION

DEPT. AW-1 • P. O. BOX 456, MIAMI 48, FLA.

ATTENTION

AIRLINE PURCHASING AGENTS

RADIO EQUIPMENT & COMPONENT PARTS

•

PARTIAL LISTING

ARC-1, MN62A, R5/ARN 7, ART-13, APN-9, BC433G, MN26C, RTA1B, ETC.—CONTROL BOXES, SHOCK MOUNTS, LOOPS LP21LM, LP21A

—

AMPHENOL AN & UG CONNECTORS

—

NEW, CURRENT GE & SYLVANIA RECEIVING & TRANSMITTING TUBES

—

OHMITE, IRC AND WARD LEONARD RESISTORS

—

SPRAGUE, AEROVOX, ERIE, ASTRON AND SANGAMO CAPACITORS

—

HICKOK, PRECISION APPARATUS, SIMPSON, WESTON AND TRIPLETT TEST SETS AND METERS

—

A letter on your stationery will place your company on our mailing list.

MERRICK AVIATION ELECTRONICS

166-08 DOUGLAS AVE.

JAMAICA 33, N. Y.

REPUBLIC 9-4632

"Servicing the Airlines"

ACC Reassures Congressmen on Its Role

Acceptance of clearing house and executive policy functions is prelude to hearings on omnibus bills.

By Katherine Johnsen

Assurances that Air Coordinating Committee considers itself a "clearing house" on aviation matters and has no intentions of encroaching on the policy-determining authority of Congress highlighted testimony by ACC's new chairman, Louis Rothschild, and Executive Secretary Lee Moore before House Interstate and Foreign Commerce Committee.

Reason for the session was "orientation"—background for a broad review of civil aviation issues later in the session. Hearings will be based on consideration of four omnibus bills introduced by top ranking members of the two committees: Chairman Warren Magnuson and Sen. John Bricker of Senate Commerce Committee; Chairman Percy Priest and Rep. Carl Hinshaw of the House group.

▶ **Policy Roles**—"I was very much surprised when ACC came out with a declaration of policy a year ago," Hinshaw said. "I thought that was a function of Congress."

Rep. Oren Harris expressed apprehension that Civil Aeronautics Administration and Civil Aeronautics Board are not free to carry out their functions as laid down in the 1938 CAA Act.

Rothschild and Moore made these points as to ACC's role:

• When unanimous agreement is reached by ACC members on an issue it amounts to "establishment" of executive policy.

• ACC, however, is without authority to require member agencies to implement the policy. "If they don't cooperate, that's the end of the matter," Rep. Martin Dies summed up. "Even if the agreement were unanimous there is nothing to prevent an agency from later reneging on its position."

• If the ACC policy report is to be implemented it is up to the agencies concerned, through the Bureau of the Budget, to submit legislative recommendations to the Congress. There have been none proposed so far, although the report was issued more than 10 months ago.

▶ **Legislative Plans**—Although ACC itself does not propose legislation, Rothschild, also Under Secretary of Commerce for Transportation, volunteered to take steps to expedite the submission of legislative recommendations by member agencies in line with ACC's policy statement. In view of the introduction of the four omnibus bills, he said the executive recommendations would take the form of endorsements or alternative suggestions.

On two important issues, all four bills make similar proposals:

• **Nonscheduled Lines.** These carriers would be required to obtain certificates of convenience and necessity in proceedings the same as now required of scheduled carriers. Existing irregular carriers would have one year after enactment in which to obtain certificates to continue operations.

CAB's authority to exempt carriers from the certificate requirement would be limited to: (1) operations involving aircraft with a gross takeoff weight of 12,500 lb. or less; (2) instances in which a certificated carrier would temporarily supplement service.

• **Contract Carriers.** For the first time, this class of carriers would be subjected to economic regulation by CAB and required to obtain "licenses" in proceedings similar to that for certificates.

CAB's authority to exempt carriers from the license requirement would be limited to cases involving the operation of aircraft under 12,500 lb. gross weight or extensions of licensed service.

Here are key provisions on which the omnibus bills differ:

• **Subsidy Separation.** Both Senate bills provide for separation and set forth a yardstick of "fair and reasonable" for determining service mail pay. In addition, the Board is directed to "take into consideration" the Universal Postal Union rate paid foreign carriers in setting rates for U.S. international carriers for similar service. The UPU rate is approximately three times as high as service rates now granted by CAB.

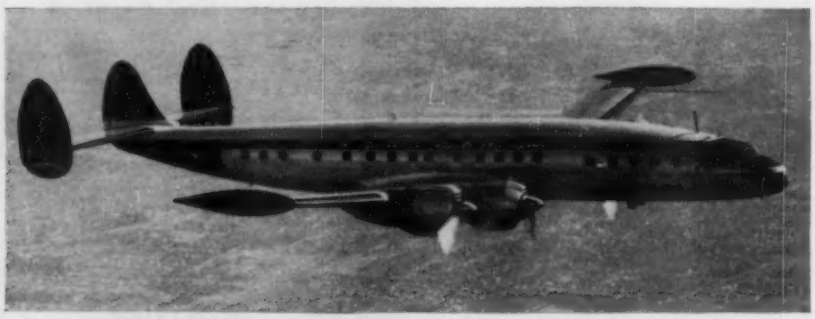
Under the Senate measures, only carriers certificated to transport mail would be eligible for subsidy, as at present. Both authorize long-term contracts for subsidy payments. The Bricker bill provides for contracts of "not less than three nor more than seven years;" the Magnuson bill, of "not exceeding five years" for international carriers and "not exceeding three years" for domestic.

By omission, both House bills leave the authority for separation to the 1953 executive order. Under this, CAB uses "cost" as the yardstick for determining service mail rates and has no authority to enter into long-term subsidy contracts with carriers.

• **White House Authority.** Three of the bills restrict executive authority.

The Magnuson bill removes White House authority to alter the decisions of CAB on overseas cases or on the economic aspects of international cases. Cases in which the President alters international decisions for national defense or foreign policy reasons, he is "requested" to report his reasons to Congress.

The Bricker and Hinshaw bills re-



NWA Flight Tests Super Connie Tiptanks

Super Constellations of five world airlines will be carrying wingtip fuel tanks similar to those on a Model 1049G of Northwest Airlines. Tanks contain 600 gal. each, providing up to 850 mi. extra range and extending the transport's capability to 4,620 mi. with reserves of 5,840 mi. absolute, Lockheed points out. NWA and TWA have one tip-tank equipped Connie. Three of NWA's on order and 19 of TWA's will have fittings so that tanks can be added. Northwest is evaluating the installation over long-range routes. All eight of Deutsche Lufthansa's 1049Gs will be equipped with the extra tanks. KLM Royal Dutch Airlines and Air France will have the installation on selected planes.

quire that international agreements creating international aviation organizations and multilateral agreements granting operating rights take the form of treaties which are subject to Senate ratification.

The Bricker bill requires bilateral agreements on operating rights to be submitted to the Senate within 30 days; the Hinshaw bill requires that they also be submitted to the House.

• **Airport Approaches.** The Secretary of Commerce is directed to "formulate and keep up to date a nationwide program for the protection of the aerial approaches to airports" in the two Senate bills. The House bills omit this provision.

• **Mergers.** CAB is directed to make a study of desirable mergers and consolidations in the air transport industry by the Bricker and Hinshaw bills.

• **Service Extensions.** CAB is authorized to order compulsory extensions of service in three of the bills. The fourth, the Hinshaw measure, would limit this authority to foreign routes.

• **Labor.** The Bricker and Hinshaw bills would bring contract carriers under the Railway Labor Act and exclude supervisory employes from its coverage.

• **Civil Penalties.** These are provided for violations of economic regulations in the Bricker bill.

National Plans Second Local Copter Service

National Airlines plans a second local helicopter service, similar to its year-old Miami experiment, in the Norfolk/Newport News/Richmond, Va., area. The trunkline helicopter operator last week petitioned Civil Aeronautics Board for exemption authority for a non-subsidized, demand-type service to begin May 1.

In justifying its request for a year's operating authority of a supplemental helicopter service on the Virginia peninsula, National pointed to the success of its Miami experiment. Original authority for National's Miami helicopter service was granted by CAB in January 1954 and was extended by the Board last month.

National told CAB that a systemwise study showed the Norfolk/Newport News area is the most promising for operation of experimental helicopter service. The area has a relatively dense population and the unusual concentration of rivers, bays and inlets are a serious handicap to rapid surface transportation. Temporary authority would be mutually beneficial to the Board and National in accumulating experience to determine the desirability of permanent operation of helicopter service, NAL said.

Comet 4 Rebids for Jet Liner Lead

De Havilland Aircraft Co. is making a determined bid with its Comet 4 to recapture the jet transport market. This week, DH representatives are scheduled to arrive in the United States in an attempt to resell Comets to major airlines.

Primary target will be Pan American World Airways, only U.S. airline to order the British transport. Informed observers believe de Havilland salesmen will go away empty handed. They say PAA has canceled its orders and options for 10 Comet 3s and now leans toward a U.S.-built jet airliner.

Officially, Pan American reports the Comet contract has been changed from a firm order to an option—but not canceled.

"We intend to look at the Comet," Pan Am officials say. "We look at them all."

▶ **First Big Order**—De Havilland already has one big order for its higher-powered jet transport.

British Overseas Airways Corp. ordered 20 Comet 4s for use as its standard transport on long-range routes. The airline canceled its contract for 12 Mark 2s and five Series 3s (with options for five more).

First delivery on the new contract, a Comet 2 airframe modified to take the Rolls-Royce R.A. 29 turbojets that will power the Mark 4, is scheduled in 1958. This will be used for training and crew familiarization. Mark 4 deliveries will follow.

BOAC officials say the Comet 4 order will not change the airline's recent contract with Douglas Aircraft Co. for 10 long-range DC-7s. The Seven Seas will operate on the North Atlantic route until BOAC begins receiving its 33 turboprop Bristol Britannias, in which the airline has invested $18.2 million in progress payments.

▶ **Comet 3 Projection**—De Havilland says the Comet 4 is a projection of the Mark 3.

"Flight trials, which have continued unremittingly since the Comet 3 first flew in July of last year, have enabled the performance of the Mark 4 Comet to be established and its aerodynamic and handling qualities have largely improved."

Much of the improvement in performance will come from developments by Rolls-Royce in the Avon turbojet. De Haviland says the R.A. 29 will give the Comet 4 a 9% improvement in specific fuel consumption and a 500-lb. increase in takeoff thrust. The Comet 3 is powered by four 10,000-lb. thrust R.A. 28s, with a specific fuel consumption of 0.86.

▶ **Greater Range**—Speed of the Comet 4 probably will be about the same as the Mark 3, but increased range is expected.

"The Mark 4 Comet will carry 58 first-class passengers on a stage length of 2,870 mi. against a 50-mph. headwind," reports de Havilland. "In effect this means BOAC will be able to fly (from London) to Johannesburg with traffic stops at Cairo and Nairobi. There will be direct services from London eastwards to Beirut, thence to Karachi, thence to Bangkok, Okinawa and Tokyo.

"On the North Atlantic route, the Mark 4 will carry its full capacity payload from London to Gander, Newfoundland, with full reserves—thus making its application to the London-New York service an economic possibility."

Despite this North Atlantic projection, BOAC is expected to limit its Comets to Middle East, Africa, Far East and India routes. The airline probably will stick by its decision to use DC-7s and eventually Britannias on the London-New York run.

▶ **Improved Comet 2**—De Havilland is going ahead with production of the Mark 2, "improved in accordance with the knowledge gained in the extensive work done by DH, the RAE, etc., during the past year."

This version will be offered for me-

New DC-7C, Britannia Orders

Orders for Douglas DC-7Cs and turboprop Bristol Britannias are increasing, with the piston-engine U.S. transport taking the larger share of new contracts.

Braniff Airways ordered seven DC-7Cs as part of its $20-million new equipment program. The contract was the largest ever signed by Braniff for new flight equipment. It increased Douglas Aircraft Co.'s backlog for the Seven Seas to approximately 45.

An additional new order for the transport may come from Northwest Orient Airlines, now weighing the advantages of DC-7 types over the DC-6B. Under a new contract signed by NWA for 10 Douglas transports, the airline has until Apr. 30 to decide which airliner it wants.

Meanwhile, El Al Israel Airlines ordered three long-range Mark 300 Britannias from Bristol Aeroplane Co. and took option on two more. El Al is the first foreign airline to sign a firm contract for turboprop British transport.

dium-stage intercontinental routes. It will be promised for delivery at an earlier date than Comet 4.

▶ **Contract Count**—De Havilland's Mark 4 and BOAC's decision to back it with a large order sets the stage for the next act in Comet operation.

Some industry observers say it will give the builder its first opportunity since the crash inquiry to find out exactly how firm are the airline orders for Comets 2 and 3.

The investigation knocked the original Comet delivery dates out of line, and now de Havilland is offering a different transport. Either of these probably would be considered a valid reason to call for complete renegotiation.

▶ **JAL Negotiations**—In Tokyo, Japan Air Lines now is trying to negotiate a cancelation of its order for two Mark 3s and clear the way for ordering DC-7Cs (AW Mar. 7, p. 69). But no final decision will be made until after the new cabinet takes office next month.

If government-owned JAL cannot cancel its contract with de Havilland without forfeiting the downpayment of more than $1 million, informed observers expect the airline to switch its order to the new Comet 4.

Executive Flights

Males-Only Service Pays Off For United

For most U. S. airlines, the big traffic gains are coming from aircoach. But United Air Lines, longtime believer in first-class, nearly doubles its evening traffic on two routes with special flights for businessmen.

Despite a surcharge, UAL's men-only Executive flights between New York and Chicago carry 8% more passengers than the route's regular parallel service. Between Los Angeles and San Francisco, it is 10% below the first-class counterpart.

The Executive's 58-passenger DC-6Bs averaged more than 3,500 businessmen a month since the six-day-a-week service started in April 1953.

Extras on the New York-Chicago Executive include a four-ounce drink before a steak dinner plus freedom to sit in shirt sleeves and to smoke cigars handed out by the stewardesses.

To sample passenger reaction, AVIATION WEEK took the westbound Chicago Executive and got these answers:

• "The average fellow sitting next to you on this flight is a salesman, a good sort of Joe who likes to talk." Another commented: "We'd all be a little more reserved with women aboard."

• "Usually I can count on running into someone I know—a business associate or a customer," said a third.

Slick Okays R6D Test, Advocates More Leases

Slick Airways reports its first month's service and operation with a Navy-leased R6D-1 (Douglas DC-6A) has been a complete success and proves the practicability of a full-scale program.

Orginally planned by the Navy as an experimental cargo lease arrangement (AW Feb. 26, p. 13), Slick has now suggested dropping the six-month's trial period if it will delay making more Navy transports available to other commercial air carriers.

▶ **Share Knowledge**—Delos W. Rentzel, board chairman of Slick, informed James H. Smith, Navy Assistant Secretary for Air, that "the experiment has worked out well and has already proved to be a complete success."

He added: "We would be very happy to see our arrangement with respect to the plane we have converted into a larger program which involves planes for other carriers engaged in serving the public."

Rentzel further offered to share the knowledge and experience gained in the initial DC-6A experiment with any other carriers leasing such planes from the Navy.

Navy has received requests from 15 civil air operators for 45 cargo transports. Rentzel said: "We had, and have, no intention or desire to gain any competitive advantage over other carriers of cargo."

▶ **Problems**—It was made clear that the integration of a naval plane into a commercial aircraft was not without its problems. However, Slick found none of these problems insurmountable.

Among the problems encountered, Rentzel said, the payload capacity was the most serious. Others included CAA certification, heavy maintenance costs and spares.

• **Payload Capacity.** Navy version of the DC-6A presently will carry 26,000 lb., compared with the commercial DC-6A capacity of 32,500 lb. Slick is installing automatic feathering in the hope of gaining 3,800 lb. additional payload and is studying other possible reductions in the empty weight.

• **Maintenance.** Early overhaul (1,400 hr.) required by the Navy's heavy maintenance program is expected to have no operational inconveniences other than a loss of three weeks service every five months. Expense is the big problem, however, running an additional $11,000 per month above the $20,000 rental.

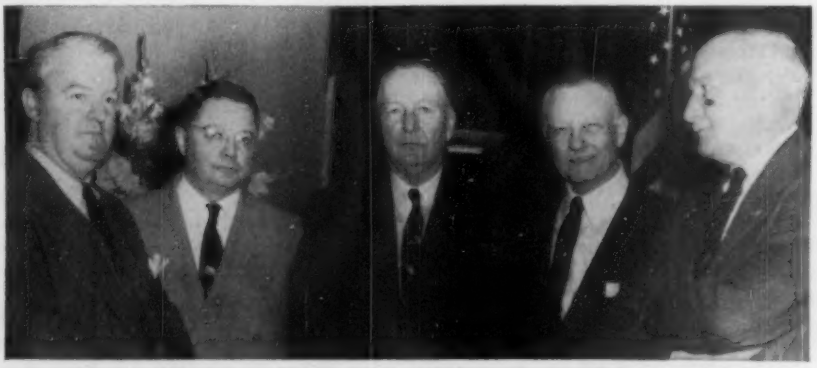
• **Spare parts.** Many minor parts of the Navy plane are not standard on the commercial version. Early Slick experience was the malfunctioning of a brake and it required several days to locate a replacement. The Navy is cooperating with parts manufacturers to provide a supply of spares to prevent loss of service in the future.

• **CAA standards.** Most serious question presented in meeting CAA requirements centered on the radio equipment. Slick found it necessary to remove the Navy's radio gear (with permission) and install commercial radio equipment. There were also modifications to the aircraft to meet CAA standards at increased payload capacity.

▶ **Future Promise**—Slick is confident Navy's proposed program holds tremendous promise for the future of the airfreight industry as well as meeting the requirements of national defense. Slick feels its part in the initial phase has served two useful purposes:

• Experience gained in readying military aircraft for commercial use should simplify and expedite future CAA certificates.

• In an emergency requiring conversion of commercial air freighters for military use the same experience would be valuable.



Ross Rizley Joins Civil Aeronautics Board

Ross Rizley (center), new chairman of the Civil Aeronautics Board, is pictured with the other members of CAB at his swearing-in ceremony. From left to right: Joseph P. Adams, Chan Gurney, Rizley, Josh Lee and Harmar Denny. Rizley has indicated to Senate members that he favors permanent certification of local service airlines, now opposed by a majority of the Board members (AW Feb. 28, p. 17).

Convair Demonstrates New Quieter 340

Los Angeles—Convair last week unveiled "the Quiet One."

This is the company nickname for an improved model 340 Convair-Liner with a greatly reduced passenger cabin noise level. It made its first public appearance in a press demonstration here.

Soundproofing is the first step in a two-part program to improve the plane. Second step will be to increase speed and gross weight. Flight testing of the speed improvements will start shortly.

The improvements are designed to bolster Convair's competitive position against the turboprop British Viscount.

▶ **Rectangular Exhaust**—Major item in the soundproofing program is a new exhaust silencer which provides a single rectangular exhaust at the aft end of each nacelle instead of the two circular openings previously used on the 340. J. G. Zevely, Convair director of sales and contracts, says the silencer is responsible for 75% of the sound improvement.

Installation of special inner windows for the first eight rows of seats, application of acoustical tape to some inner surfaces of the cabin's dural plating, and installation of additional soundproofing material in critical areas are among the other improvements.

Weight of the additional soundproofing is 900 lb., according to Zevely, who adds that this will be more than compensated for by speed improvements which will increase payload.

▶ **External Refinements**—Speed-improvement program will include changes in such items as engine baffles, oil cooler inlet ducts and flap and aileron gap seals. Each change will be certificated separately so that an airline may choose all or part of the changeover to provide the most improvement at the least cost.

A three month-flight test program on speed improvement is scheduled to begin immediately in San Diego on a specially equipped aircraft. CAA certification is expected by June. Kits for 340s already in airline service will be available and the changes will be incorporated in all new Convair-Liners.

The program is expected to increase the speed of the 340 by a minimum of 5 mph. But the full amount of the increase will not be known until completion of the flight test program.

Soundproofing work on the Convair-Liner was in cooperation with Bolt, Beranek and Newman, Inc., of Cambridge, Mass. The acoustics consulting firm was retained by Convair to analyze sources of sound on the 340 and devise ways to overcome the high noise level. Lear, Inc., acted as consultant on the speed-improvement program.

The Convair-Liner demonstrated to the press here incorporated only the soundproofing changes. Noise level was noticeably less than that of 340s now in airline service. It appeared to observers to have been reduced to a level comparable with a DC-3.

American Competition

American Airlines is reported near a decision in its competition for a medium range turboprop transport. A choice will probably be made within 30 days.

Aircraft manufacturers definitely participating in the competition are Convair, Douglas, Lockheed and Vickers. Three others—Boeing, Fairchild and A. V. Roe—are reported to have submitted bids.

American called in several outside aeronautical engineers on a temporary basis to analyze the mass of data submitted by bidding companies.

Net Down, Gross Up, EAL Asks Fare Hike

Eastern Air Lines reported a 1954 net profit of $7,152,012 on a record gross revenues of $169,937,661. This compares with net earnings of $7,921,367 on revenues of $144,468,385 in 1953.

Capt. Eddie Rickenbacker, EAL board chairman, credited the company's rapid conversion to air coach with producing the record traffic volume and new high in revenues. Eastern's passenger revenue reached an all-time company high of $161,239,702 in 1954, or a gain of 18% over the previous year, all of which came from increased aircoach business.

▶ **'Prompt' Fare Action**—However, Rickenbacker was concerned over the close margin between earnings and expenses. He renewed the industry's growing demand for "prompt" and "decisive action" from CAB for an increase in fares. A more realistic relationship between the rates charged the public and the greatly improved service being offered is needed, Rickenbacker said. CAB's resolution of this critical fare problem would do more to aid expansion of service and strengthen the industry than any other single factor, he declared.

Highlights of EAL's 1954 report:

• **Gross revenues** increased $25,469,276 to a total of $169,937,661, an 18% gain over 1953.

• **Passenger revenues** from aircoach service reached $56,413,959, up 77% from $31,855,430 in 1953, while first-class sales declined slightly to $101,134,180, compared with $101,280,275 in 1953.

• **Cargo revenues** were made up from airfreight, $2,318,854; air express, $1,711,183; airmail, $3,068,285; and surface-mail-by-air, $318,690.

• **Operating expenses** increased 19% from $127,110,922 in 1953 to $151,261,153 last year.

• **Cash balance** stood at $61,911,064 on Dec. 31, with working capital increased to $37,740,428, for gains of $15,477,209 and $23,367,763, respectively.

• **Eastern improved** its working capital position during the year by amending its $36 million bank loan agreement with repayment deferred until Mar. 31, 1956, when the first of 12 quarterly installments of $3 million will be paid.

Court Upholds Sale Of Cal Central Fleet

Los Angeles—Sale of the $800,000 assets of bankrupt California Central Airlines and Airline Transport Carrier, Inc., to Southwest Airways Co. and Allegheny Airlines, Inc., was confirmed by U. S. District Court Judge Pierson Hall in a recent hearing.

The court contended that because of the economic emergency, immediate sale was necessary.

Trustee William Wiley said the assets—four Martin 2-0-2s, one DC-3 and spare parts—have been delivered to and paid for by Southwest and Allegheny and "all creditors who had claims against the debtor have been paid as of last week. The matter is closed so far as I, a trustee, am concerned."

Despite the bankruptcy proceedings, California Central Airlines continues to operate with leased equipment.

NEA Orders DC-6Bs For Expanded Service

Northeast Airlines ordered 10 DC-6Bs last week from Douglas Aircraft Co. for delivery in 1957. Cost is approximately $15 million.

George E. Gardner, NEA president, said the first three transports would be used to expand the airline's present services in New England to Montreal and New York City. Seven additional DC-6Bs were ordered, he said, in anticipation of Civil Aeronautics Board's authorization to extend Northeast's routes from New York to Miami.

Gardner reported to his stockholders that he had considered purchasing the larger DC-7 or other aircraft but decided that the DC-6B was best suited to Northeast's present operation and contemplated expansion. Northeast currently operates a 19-plane fleet, 12 Douglas DC-3s and 7 Convair 240s. The order for DC-6Bs made NEA the 15th U. S. airline to order post-war four-engine transports from Douglas.

CAB ORDERS

(Mar. 3-9)

GRANTED:

Ozark Air Lines permission to inaugurate service at Clinton Municipal Airport on or about Mar. 10, 1955.

City of Chadron, Nebr., leave to intervene in a case involving elimination by Western Air Lines of Richfield and St. George, Utah, and Chadron, Neb., as intermediate points on Routes 13 and 35.

APPROVED:

Resolutions adopted by the International Air Transport Assn. between various carriers relating to student fares between Bermuda and Montreal.

Resolutions adopted by the International Air Transport Assn. between various carriers relating to ground transportation charges, to include Spain.

Agreements between Delta-C & S Air Lines, Trans-Texas Airways and various other carriers relating to intercompany arrangements.

AUTHORIZED:

Braniff Airways to suspend service temporarily at Rockford, Ill., as soon as Ozark Air Lines inaugurates comparable service between Rockford and Chicago. Such suspension will continue only as long as Braniff offers its current quantity of service to Fort Dodge and Dubuque, Iowa.

ORDERED:

Consolidation of applications filed by Eastern Air Lines, American Airlines, Trans-World Airlines and the Commonwealth of Kentucky for various services to St. Louis, Memphis, Cincinnati, New York, Washington and other points.

Stay of Ozark Air Lines' recently granted authority to add Galesburg, Ill., to Route 107, until Apr. 7, 1955.

Investigation and suspension of certain reduced rates for cut flowers filed by Airborne Flower and Freight Traffic, Inc.

Investigation and suspension of certain new rates filed supplementary to tariffs already under investigation and suspension which were filed by American Airlines, Capital Airlines, Northwest Airlines, Slick Airways, the Flying Tiger Line, Trans World Airlines and United Air Lines.

DISAPPROVED:

An agreement between the Flying Tiger Line and Airborne Flower and Freight Traffic, Inc. relating to commodity rates.

DISMISSED:

Aerovias Sud Americana's application for an exemption to carry cargo between Bogota, Colombia, and Leticia, Colombia, by request of the company.

DENIED:

Braniff Airways' motion for immediate and separate hearing in the Williston Basin area case.

Trans-Pacific Airlines' motions to strike exceptions filed by Hawaiian Airlines in the Hawaiian and Trans-Pacific mail rate cases and the Trans-Pacific renewal case.

(Mar. 10-16)

GRANTED:

Air Transport Assn. leave to intervene in the air freight forwarder investigation.

Transocean Air Lines an exemption to perform six flights from Germany to New York pursuant to a contract with the Intergovernmental Committee for European Migration. Transocean is permitted to use an Iranian-registered DC-4 in the flights.

Leave to intervene in the New York-Florida proceeding to various communities and other interested parties.

APPROVED:

Los Angeles Airways' pattern for transportation of passengers and property between Los Angeles International Airport and Santa Monica Heliport, and for carrying passengers between these points and North Hollywood on the same flight.

Agreements between Northwest Airlines, Northeast Airlines and various other carriers relating to intercompany arrangements.

Resolutions adopted by the International Air Transport Assn. on agreements between various carriers relating to rates and agreements on construction of passenger fares.

AUTHORIZED:

Central Airlines to suspend service temporarily at Chickasha, Okla.

National Airlines to operate temporary service Newport News-Hampton-Warwick, Va., with a restriction against serving Washington, Baltimore or Richmond on the same flight.

Allegheny Airlines to serve Trenton, N. J., as an intermediate point between New York-Newark and Philadelphia-Camden. Trenton is eliminated from the certificates of Eastern and United Air Lines.

AMENDED:

Previous Board order to correct certain statements made in reference to Delta-C&S Air Lines.

DENIED:

Petitions of Greensboro-High Point Airport Authority, Charleston, W. Va., Chamber of Commerce and County Court of Kanawha, W. Va., for reconsideration in the Charleston-Columbus case.

India Viscount

(McGraw-Hill World News)

New Delhi—Indian Airlines' decision to buy six turboprop Vickers Viscounts was supported by a technical committee on civil aircraft in a final report to the government on the proposed purchase.

Members of the committee said they decided against Convair's 340 on grounds that the British transport is superior in performance, safety and general economy of operation.

The technical group began evaluating the two aircraft after Indian Airlines decided about 18 months ago to buy Viscounts and stuck by the British airliner when the government asked the carrier to re-examine its decision.

SHORTLINES

► **Cayman-Brac Airways, Ltd.** has been formed to provide air service in the Cayman Islands, BWI. Service will be operated with twin-engine Cessna aircraft in affiliation with Lacsa, the Costa Rican airline.

► **Central African Airways** carried 11,219 passengers in January, compared with 10,285 for the same month in 1954. The carrier operated with a load factor of 62.9% during the month.

► **Braniff Airways** will cut international fares to South America up to 25% for group travel. The excursion fares will apply to groups of 15 or more and will be effective between June 1 and Aug. 31.

► **British Overseas Airways Corp.** increased passenger traffic between New York and the Caribbean by 25% during 1954 on all scheduled services.

► **KLM Royal Dutch Airlines** has scheduled a special tour of European theatrical points of interest. The 40-day trip, scheduled to leave New York June 5, will cost $1,875.

► **National Airlines** reports a traffic gain of 26% for February. Revenue passenger-miles flown were 93,382,000, against 75,254,000 for February 1954.

► **Qantas Empire Airways** has increased its service between Sydney and San Francisco to three flights a week. One first-class and two combination flights will be operated weekly.

► **Swissair** has introduced a pay-later scheme called the Creditaire Plan for U. S. travelers. Based on the usual terms, it can include costs of hotels, meal and various other expenses incurred by travelers.

► **Trans World Airlines** reports increases in freight traffic for February. Domestic ton-miles came to 1,710,000, 17.6% over February 1954; express ton-miles were 535,000. International freight flown amounted to 713,000 ton-miles, a 9.4% increase.

► **United Air Lines** introduced a "self-claiming" baggage service at Omaha and Denver to speed baggage handling by having passengers pick up their own luggage from station claiming racks . . . United flew 250,259,000 revenue passenger-miles in February, a 34% increase over the same month in 1954. Freight traffic was 2,736,000 ton-miles, express 830,000 ton-miles and mail 2,059,000 ton miles.

ADVERTISERS IN THIS ISSUE

AVIATION WEEK—MARCH 28, 1955

AIRWORK CORPORATION 34
Agency—Gene Wyble Advertising
AMERICAN WELDING & MFG. CO. 33
Agency—The Bayless-Kerr Co.
AUSTENAL LABORATORIES, INC. (MICROCAST DIVISION) 56
Agency—Gaynor & Company, Inc.

BENDIX PRODUCTS DIV., BENDIX AVIATION CORP. ..... Third Cover
Agency—MacManus, John & Adams, Inc.
BRIDGEPORT BRASS COMPANY (ALUMINUM DIV.) 60
Agency—Hazard Advertising Company

CANADIAN INTERNATIONAL TRADE FAIR 73
Agency—MacLaren Adv. Co. Ltd.
CLIFTON PRECISION PRODUCTS CO., INC. 52
Agency—Ivey Advertising Company
CONTINENTAL MOTORS CORP. 59
Agency—The Hopkins Agency
CONVAIR, A DIVISION OF GENERAL DYNAMICS CORP. 10
Agency—Buchanan & Co., Inc.

EASTERN INDUSTRIES, INC. 89
Agency—Remsen Adv. Agency, Inc.
EASTMAN KODAK CO. 3
Agency—J. Walter Thompson Co.
ECLIPSE-PIONEER DIV., BENDIX AVIATION CORP. 57
Agency—MacManus, John & Adams, Inc.
ELASTIC STOP NUT CORP. OF AMERICA 64
Agency—G. M. Basford Company
ELECTRO-MECHANICAL RESEARCH, INC. 51
Agency—Moore & Company, Inc.

GENERAL ELECTRIC COMPANY 65, 66, 67, 68
Agency—G. M. Basford Company
GENERAL PRECISION LABORATORY, INC. 23
Agency—Burke Dowling Adams, Inc.
GOODYEAR TIRE & RUBBER CO., INC. ..... Front Cover
Agency—Kudner Agency, Inc.
GREENLEAF MFG. COMPANY, THE 54, 55
Agency—Oakleigh R. French & Assoc.

HEINEMANN ELECTRIC COMPANY 48
Agency—Thomas R. Sundheim Adv.
HUSSMANN REFRIGERATOR CO. (AIRCRAFT DIV.) 27
Agency—H. George Bloch Adv. Co.

KAYNAR COMPANY, THE KAYLOCK DIV. 20
Agency—J. H. Strauss & Co.

LAVELLE AIRCRAFT CORP. 32
Agency—The Roland G. E. Ullman Organization
LEAR, INC., LEARCAL DIV. 35
Agency—Buchanan & Co., Inc.
LOCKHEED AIRCRAFT CORP. 70
Agency—Donahue & Coe, Inc.

MALLORY-SHARON TITANIUM CORP. 71
Agency—The Griswold-Eshleman Co.
MANNING, MAXWELL & MOORE, INC. 41
Agency—Fuller & Smith & Ross, Inc.
MARION ELECTRICAL INSTRUMENT COMPANY 45
Agency—Meissner & Culver, Inc.
MARMAN PRODUCTS COMPANY 10
Agency—West Marquis, Inc.
MELETRON CORPORATION 63
Agency—Welsh, Holland & Coleman Adv.

NATIONAL AERONAUTICAL CORP. 8
Agency—Davis, Parsons & Strohmeier, Inc.
NORTHROP AIRCRAFT, INC. 62
Agency—West-Marquis, Inc.
NORTH AMERICAN AVIATION, INC. 5, 44
Agency—Batten, Barton, Durstine & Osborn, Inc.
NUTT SHEL COMPANY 26
Agency—Welsh, Hollander & Coleman Adv.

PROTO TOOLS 4
Agency—Willard G. Gregory & Co.

REMINGTON RAND, INC. 6
Agency—Leeford Adv. Agency, Inc.
RESIN INDUSTRIES, INC. 8
Agency—Taggart & Young Adv.
REYNOLDS METALS COMPANY ..... Fourth Cover
Agency—Clinton E. Frank, Inc.
RHEEM MFG. COMPANY, GOVT. PRODUCTS DIV. 39
Agency—Campbell-Ewald Co.
ROBINSON CO., RALPH C. 44
Agency—Chapin-Damm Adv.

SEARCHLIGHT SECTION 74, 75, 76, 77, 78, 79, 80, 81, 82, 83
SKYLINE PRODUCTS, INC. 45
Agency—Triton Advertising
SPERRY GYROSCOPE CO., DIV. THE SPERRY CORP. 53
Agency—Reach, Yates & Mattoon, Inc.
SURFACE COMBUSTION CORP. (JANITROL AIRCRAFT-AUTOMOTIVE DIV.) 24
Agency—Odiorne Industrial Adv.

THOMPSON AIRCRAFT TIRE CORP. 31
Agency—Norton M. Jacobs Adv. Agency
TRANS WORLD AIRLINES, INC. 46, 47
Agency—Batten, Barton, Durstine & Osborn, Inc.

WESTINGHOUSE ELECTRIC CORP. 50
Agency—Ketchum, McLeod & Grove, Inc.
WHITTAKER CO., LTD., W. R. 72
Agency—Mogge-Privett, Inc.
WIGGINS OIL TOOL CO., INC., E. B. ..... Second Cover
Agency—Byron H. Brown & Staff

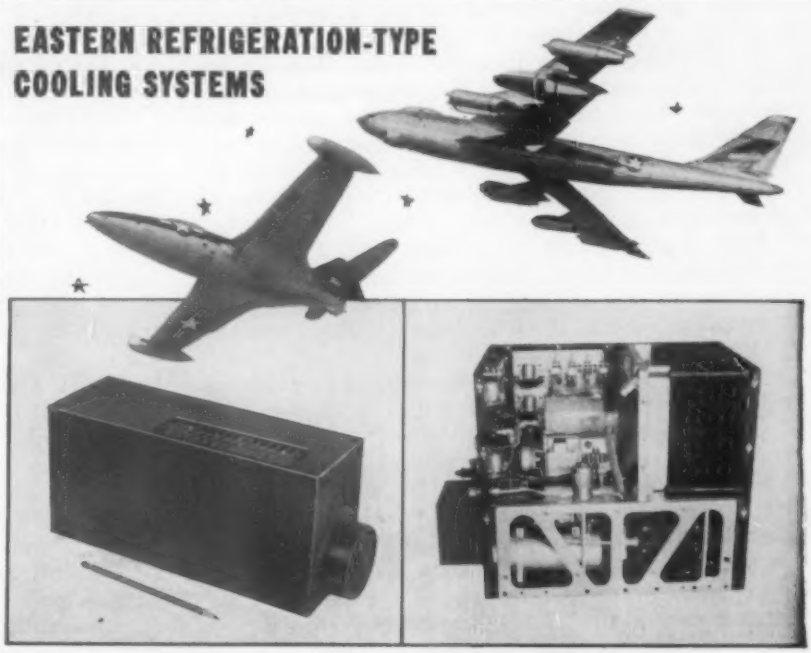
SEARCHLIGHT SECTION

(Classified Advertising)

H. E. HILTY, Mgr.)

EMPLOYMENT
Positions Vacant 74-81
Positions Wanted 81
SPECIAL SERVICES
To the Industry 82
Repairing 80-82
PLANES—EQUIPMENT
(Used or Surplus New)
For Sale 82-83
WANTED
Planes—Equipment 81

EASTERN REFRIGERATION-TYPE COOLING SYSTEMS



. . . maintain a predetermined temperature range in electronic equipment

SPECIFICATIONS:

Operate up to 70,000 feet.

Ambients up to 185°F.

Units from 100 to 6,000 watts capacity.

Operating range from below 0°F. to 100°F.

Pressurized evaporators available with units.

Explosion-proof systems complete in one container for many applications.

Normal aircraft power sources can be used.

Complete Refrigeration Cooling Systems using various gases and liquids as cooling media in closed-cycle operation, are Eastern specialties. Within the conditions shown at the left, these compact airborne units can be supplied complete with one heat exchanger, or with several exchangers in different locations as a centralized compressor unit.

Eastern welcomes inquiries regarding custom made or adapted units. They meet appropriate government specifications and can solve your specific cooling problems.

Write for data on Eastern's Cooling Unit line, included in Eastern Aviation Catalog No. 330. Related Pressurization Equipment and Hydraulic Products are also described in this catalog.

Eastern

EASTERN AVIATION PRODUCTS

INDUSTRIES, INC.

100 SKIFF ST., HAMDEN 14, CONN.

EDITORIAL

Military Tacan vs. Civil DME—A Bad Mess!

Current congressional investigation of the conflict between military short-range navigation system (Tacan) and the distance measuring equipment (DME) portion of the civil system has shed light on a bad mess. It should be cleaned up as fast as possible or it will cause even more bitter controversy and greater danger to the air defense systems of Western Europe and the North American continent in the years ahead. The present Air Navigation and Development Board should be commended for its courage in facing this problem squarely and making a decision, knowing full well the hornets' nest it would stir into action.

Responsibility for the Tacan-DME mess does not belong to the present ANDB. It is the product of some incredibly stupid blundering by both the military and civil agencies involved during the past five years. It was the rock on which the former ANDB split and foundered. All parties concerned were aware that a painful day of reckoning was inevitable.

The present ANDB has demonstrated that it can handle these acute civil-military technical conflicts in development of a common air navigation system by its outstanding work on the joint radar transponder beacon program that has satisfied all elements involved. ANDB organization and operating machinery should not be altered because of the inherited Tacan-DME mess.

As Philip Klass, AVIATION WEEK's avionics editor, emphasized in his excellent treatment of the Tacan-DME controversy background (AW Mar. 14, p. 279), the fundamental point involved is the change in the air defense problem between 1947-48 when the framework of the common navigation system was organized and the present when the shadow of the Russian long-range bomber fleet, armed with hydrogen bombs, is growing longer over the North American continent.

In 1947-48 it was possible to have a common domestic navigation system for both military and civil aircraft. Then the military concern for its tactical navigation system was primarily for something to be used in overseas theaters similar to the way very high frequency radio was used in World War II—often in areas where no navigation aids previously existed. In 1955 it is obvious that any air defense system for either Western Europe or the North American continent must be based on a navigation and identification system that includes all friendly civil aircraft. It must also be equally useful for Navy carrier-based aircraft if all of our interceptor squadrons are to be available for blunting an enemy attack.

The fact that the military have been unusually callous and obtuse in making their requirements and problems clear to the civil agencies involved does not alter the stark reality of the air defense requirement. We do not blame the civil groups involved if they have reacted with over-sensitivity to this military attitude for they have suffered greatly from the same type of military subterfuge and lack of candor on other military-civil aviation problems, notably airports and air space.

However, in fairness to the military, their recent testimony has made clear the conflict does not involve the VOR omnirange program and is confined entirely to the DME portion of the civil program.

Trevor Gardner, Assistant USAF Secretary for Research and Development, hammered this point home with testimony that USAF is buying 26,000 VOR airborne sets, of which 5,500 will go to the Navy.

Nor is military classification of the Tacan system any longer a legitimate issue. Decision to de-classify Tacan details has been made and the necessary paperwork to implement the decision is being processed with foreign governments involved. This emphasizes again that the Tacan-DME row is not just a local fuss but concerns Canada, Great Britain and the NATO countries.

Civil DME, which will be affected by the conflicting frequencies of the Tacan system, is now a reliable piece of equipment. However, it is not yet in widespread use nor is it likely to be for the next few years. An airborne DME set now sells for close to $5,000 and most of the 250 sets manufactured to date have been bought for corporation aircraft. Commercial manufacturers of the airborne DME equipment were given written warning by the military that this was a highly speculative venture. The manufacturers that decided to proceed with airborne DME equipment gambled on getting a substantial competitive jump on the rest of the field. If civil DME is scrapped they stand to take a loss on this venture. However, ANDB has recommended that substantial development contracts for lightweight civil-type Tacan equipment be placed with commercial manufacturers to enable them to get a good start in this equipment if it succeeds DME.

Main point of the ANDB decision is that no final decision can be made on the Tacan-DME problem until at least two years while technical development continues on the Tacan system. Tacan now is about as unreliable as the VOR equipment was when it was initially programmed as part of the common system.

In essence, ANDB has decided to speed development of Tacan and slow operational use of DME until sufficient data is available for sound technical decision.

The airlines place a higher priority on getting the radar transponder beacon operational and installation of more long range traffic control ground radar equipment for increasing their instrument flight operational capacity. Except for some large corporations, private pilots will not be able to afford DME during this period.

Congress has done valuable service by bringing many hitherto unavailable facts on this controversy into the public record, but nothing now on this record indicates there is any reason to alter the basic ANDB decision.

This decision, if properly implemented, should make it possible to reach a sound resolution of this problem within the next two years at a minimum cost in scrapped equipment through a maximum effort to provide a truly workable common military-civil navigation system that will also serve the continental air defense system.

—Robert Hotz

Bendix Products Division

A DEPENDABLE SOURCE

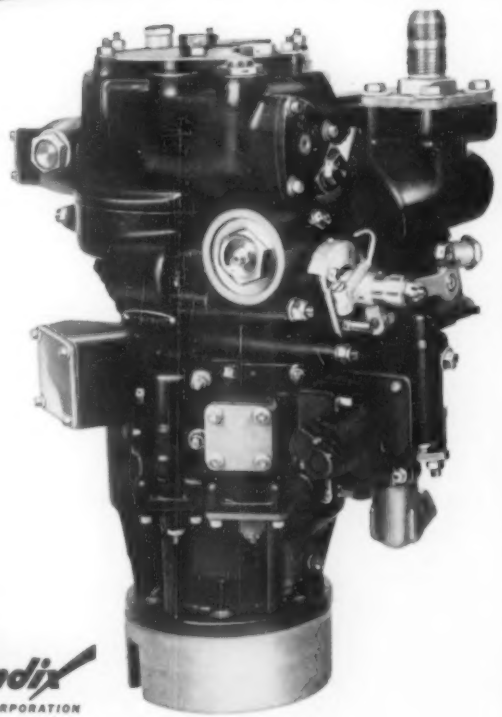
FOR CREATIVE ENGINEERING AND QUALITY MANUFACTURING

BENDIX Products Division has long specialized in FUEL METERING, ENGINE CONTROL SYSTEMS and LANDING GEAR.

SERVING ALMOST ALL American airframe and engine manufacturers, Bendix can bring much of the COMBINED KNOW-HOW OF THE INDUSTRY to the benefit of any one project.

FOR EXAMPLE...

This advanced type fuel metering unit was developed by Bendix to include special features for the 10,000-pound thrust class Pratt & Whitney J-57 turbojet—the engine which puts the power behind the super performance of the F4D Skyray.



As early as 1945, Bendix brought out a jet engine control which automatically metered fuel during engine acceleration and deceleration so as to avoid over-temperature, compressor stall and "flame out". Since then, these features have become a "must" on all jet engine controls, allowing the pilot to slam the throttle wide open without danger of ruining the engine, or slam it shut without risk of "flame out".

Bendix fuel metering is used today on nearly all American airliners, and on a great majority of military aircraft. This includes injection type carburetors and direct fuel injection, as well as fuel metering and complete engine control systems for jets.

These and other achievements are solid evidence that the aircraft industry can continue, as in the past, to look to Bendix for creative engineering and quality manufacturing.

Float and injection type carburetors . . . Direct injection fuel systems . . . Fuel metering and engine control systems for jets and turboprop engines . . . Brakes, wheels and shock absorbing struts for all types of airplanes.

BENDIX PRODUCTS DIVISION **SOUTH BEND** INDIANA

Bendix AVIATION CORPORATION

Export Sales: Bendix International Division, 205 E. 42nd St., New York 17, N. Y.

E B POWER GS
UNIVERSITY MICROFILM IN
313 N 1ST ST
ANN ARBOR MICH

Fabrication of aft fuselage sections for Boeing KC-97 Stratofreighter aerial tankers.

In-flight refueling pods for Boeing KC-97's.

From fighters to freighters, American plane makers rely on *Ryan*

Both prime contractor and sub-contractor for others, Ryan Aeronautical Company is currently working on Air Force, Army and Navy aircraft ranging from aft fuselages for North American F-86 jet fighters to huge components for the Boeing KC-97 Stratofreighter as illustrated. The Ryan Firebee drone missile, fuselage section for the Boeing KC-135 jet tanker and a new jet-powered vertical take-off aircraft are other timely Ryan projects where Reynolds Aluminum mill products are put to use on the vast Ryan production lines.

Whenever aviation advances, Reynolds Aluminum advances with it. Every step in Reynolds production is geared to the requirements of all constantly progressing industries.

Reynolds goes beyond meeting rigid material specifications. Reynolds technical services make a continuing contribution to customers' design and engineering staffs—make Reynolds a part of the aircraft industry rather than just a supplier.

Write the *Reynolds Metals Company, 2559 So. Third St., Louisville 1, Kentucky.* Ask for full information about how Reynolds can serve you.

Fuel tank nose section for Boeing KC-97 cleaned in hot alkali bath prior to spot welding.

See "Mister Peepers", starring Wally Cox, Sundays on NBC-TV

REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND